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South Australia.

A REVIEW

OF

MINING OPERATIONS

IN THE

STATE OF SOUTH AUSTRALIA

DURING THE

HALF-YEAR ENDED DECEMBER 31st, 1912.

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Compiled by LIONEL C. E. GEE, S.M., Chief Registrar and Recorder, Department of Mines.

ISSUED UNDER THE AUTHORITY OF THE

HONORABLE RICHARD BUTLER, M.P.,

Minister of Mines,

By F. C. WARD, *Acting Secretary for Mines.*

DEPARTMENT OF GEOLOGICAL SCIENCES,
UNIVERSITY OF TORONTO

Adelaide:

R. E. E. ROGERS, GOVERNMENT PRINTER, NORTH TERRACE.

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Miners' Rights and Privileges thereunder.

A miner's right is obtainable at the Department of Mines, Adelaide, also at the issuing stations in the various mining districts, at a cost of 5s.

A miner's right is in force for one year from the date of issue, and may be renewed at any time during its currency for another term of one year on payment of 5s.

The holder of a miner's right is authorised to prospect on any mineral lands for any metal, mineral, coal, or oil, and to peg out (of the prescribed shape and dimensions) gold, mineral, coal, and oil claims, and also leases of a like nature.

AREAS AND WORKING CONDITIONS.

GOLD LEASES—Maximum area, 20 acres; working conditions, one man to every five acres.

MINERAL LEASES—40 acres; one man to every 10 acres.

MISCELLANEOUS LEASES—

Salt	640 acres;	special conditions.
Gypsum	640 "	"
Mining Works	10 "	one man.
COAL OR OIL LEASES	640 "	one man to every 40 acres.
GOLD DREDGING LEASES	200 "	special conditions.
MINERAL CLAIMS	40 "	
GOLD CLAIMS	30ft. x 30ft., alluvial; 100ft. x 600ft., reef.	

Gold claims must be constantly worked—one man for each claim—and mineral claimholders must employ two men for each claim. Amalgamation of either gold or mineral claims reduces the labor conditions by one-half.

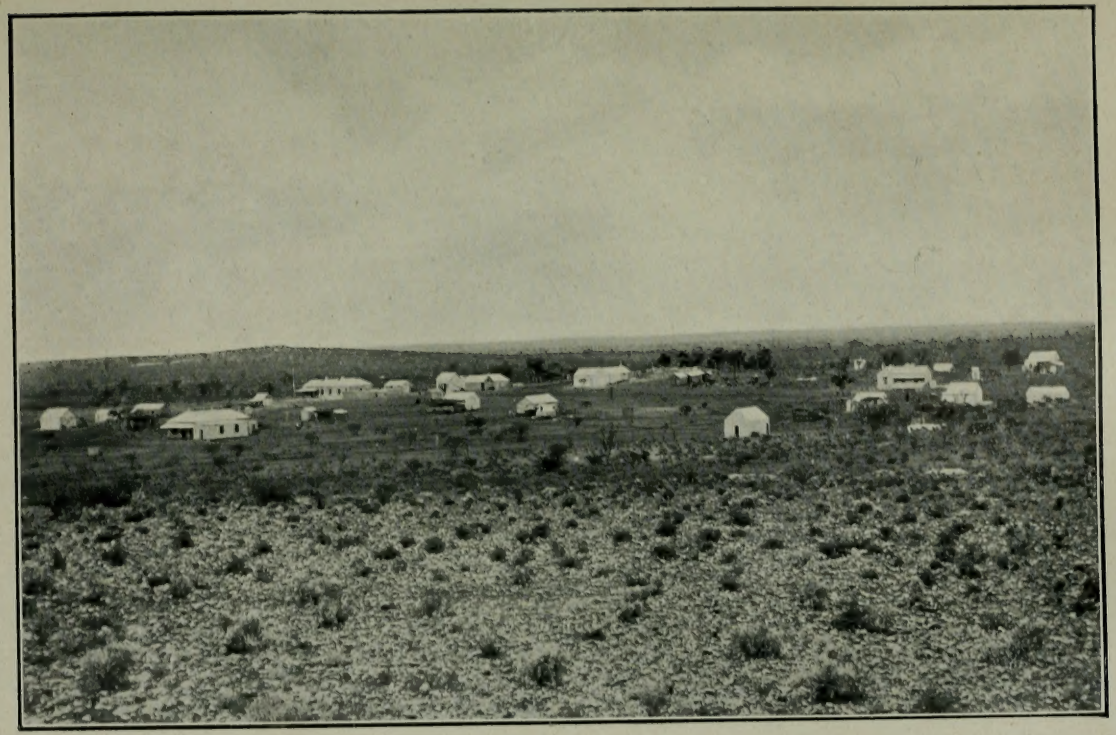
Gold, mineral, coal, and oil leases are granted for a term of 42 years—the two former at a rental of 1s. per acre per annum and a royalty of 6d. in the pound on net profits, the latter at a rental of 6d. per acre per annum until coal or oil is found in payable quantities, when 1s. per acre is payable and a royalty of 6d. in the pound on the net profits.

The Minister may permit, for the concentration of labor, of the amalgamation of not more than four adjoining gold or mineral leases.

Any number of gold, mineral, coal, or oil leases may be held by one person.

Licences to search for twelve months for precious stones, mineral phosphates, oil, rare metals, minerals, and earths are issued on specific mineral lands, not exceeding five square miles in area for one person, a fee of 20s. being charged for each square mile or portion thereof. These licences give a preferential right to a lease over a portion of the area, as prescribed.

[To face p. 21.



BIRD'S EYE VIEW OF TARCOOLA.—ALL GALVANIZED-IRON BUILDINGS.

PREFACE.

The price of standard copper for the year 1912, has averaged £73 1s. 3d. per ton, the highest yearly average since 1907. The production of copper has therefore increased, and mining matters generally have been beneficially stimulated.

The discovery of some rich silver ore specimens at Miltalie, near Cowell, Franklin Harbor, will, it is hoped, have the effect of calling attention to a large and highly mineralized district which has so far been only casually and intermittently prospected.

The gold returns for the year, although still very small, are much better than had been anticipated.

There has been much enquiry and search after lakes and lagoons from which marketable salt can be scraped.

LIONEL C. E. GEE,

Chief Registrar and Recorder, Department of Mines.

February 22nd, 1913.

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Mining Operations during the Half-year ended December 31st, 1912.

AREA AT PRESENT HELD UNDER MINING ACTS (DEC. 31ST, 1912).

Nature of Holding.	Number.	Area.
Mineral leases	252	12,101 acres
Gold leases	76	1,424 "
Gold dredging leases	1	100 "
Miscellaneous leases	57	15,369 "
Mineral claims	531	19,997 "
Occupation licences	234	117 "
Search licences	130	240,000 "
Coal claims	5	3,200 "
Gold claims	5	12 "
Total holdings	1,291	292,320 acres

REGISTERED FROM JUNE 30TH, 1912, TO DECEMBER 31ST, 1912.

Mineral claims	171	6,800 acres
Gold leases	15	300 "
Mineral leases	18	720 "
Miscellaneous leases	13	5,918 "
Miners' rights	658	—
Search licences	110	227,200 "
Coal and oil claims	—	—
Gold claims	—	—
Total	985	240,938 acres

MEN EMPLOYED.

Estimated number of men employed in mining and mineral works, June 30th, 1912:—

Copper	4,500
Gold	920
Salt	500
Silver-lead	30
Other minerals	550
Smelting works, Port Pirie	1,280
Total	7,780

GENERAL NOTES.

The price of standard copper for the six months under review has averaged £77 5s. 2d. per ton ; that of the previous six months £68 17s. 4d., and for the whole of the year 1912, £73 1s. 3d. per ton, an improvement of £16 19s. 5d. per ton compared with the average of £56 1s. 10d. for the year 1911.

Under this stimulus the production of copper has increased, and there has been a satisfactory increase in the general business under the Mining Acts during the year. For example, 280 mineral claims were taken out against 149 in 1911, and the miners' rights issued number 1,045 in 1912 against 660 in 1911.

From the *Moonta* 16,055 tons of 2·79 per cent. ore were treated, and from the *Wallaroo* 58,052 tons of 3·79 per cent. ore during the six months. The *Moonta and Wallaroo* Company declared the usual dividend in September. At the meeting the directors reported that the amount of available payable ore ground now left in the *Moonta* is not large, and the shareholders cordially supported the suggestion that about £7,000 should be devoted to testing the ground below the 1,200ft. level in the west lode opposite the main ore body at Taylors'. The treatment of the large quantities of slimes and tailings on surface at this mine has been very successful, and it is estimated that about 3,200 tons of fine copper will be obtainable from this source during the next five years. At the *Wallaroo Mines* the lodes at the deeper levels still maintain their productiveness.

Work at the *Hamley* has consisted of stoping and treating ore ; 194 tons of 19 per cent. concentrates, and 48 tons of 9 per cent. slimes have been produced.

The *Mount Lyell Consols Wallaroo* (*Bingo*) Company has made steady progress at its holding, near Kadina, in the way of shaft-sinking and crosscutting. Two lodes have been struck in the crosscut at the 260ft. level ; the formation at No. 1 is 18ft. wide and about 7ft. of it is estimated to average 8 per cent. A sample taken from 5ft. of this portion assayed 17·2 per cent. copper and 1oz. 5dwts. gold. The lode is going strongly underfoot, and when the shaft is deepened and the levels opened up, a large amount of stoping ground will be available. No. 2 lode was struck 39ft. farther in the crosscut, and will probably junction with No. 1 at depth. Other developments in the mine are satisfactory. Report by Inspector Jones, page 48.

A syndicate has been formed to rework the *Kanmantoo Copper Mine*, and a start made at unwatering the Emily workings. A subsidy has been granted by the Government. Detail report, page 49.

At the *Warra Warra* driving has been done from some of the shafts, and also prospecting work along the line of lode at the west end of the lease. No ore has been sent to market.

No work has been done at *Appealina*. Large quantities of high-grade ore have been produced from this mine in the past, and the holders are now trying to raise capital to open up and develop on a proper scale.

Mount Gunson.—The metallurgist and a staff of men are employed in making leaching experiments on the low-grade copper ore (*vide* Inspector's report, page 43).

At the *Clara St. Dora* prospecting is in progress, and a little high-grade copper ore has been obtained by following veins in drives and open cuts.

No work has been done at the *Belalie Mine*.

There has been a general sampling of the underground workings at *Mutooroo*. The treatment of the mine water by precipitation continues, but no clean-up took place during the six months.

The Manager (Mr. R. H. Williams) has supplied the following summary of work done on the *Montacute Gold and Copper Mine*, situated near Sixth Creek :—The Government is subsidising the enterprise (*vide* also Record of Mines, pp. 15, 84, and 218, and Reviews Nos. 15 and 16). During the past 12 months a considerable amount of prospecting work has been done on this property. In addition thereto the old drives and workings have been thoroughly cleaned out and examined, and in places made safe by timbering. In No. 1 drive a winze has been sunk to a depth of 20ft. and a large mullocky lode and a rich vein of copper discovered, which, however, was not extensive enough to prove payable. A continuation of Lean's Tunnel was also made towards Lean's Shaft for a distance of about 6ft., but on acccount of the remarkable results obtained by some tributors, who were prospecting for gold on the flat between Montacute Hill and Sixth Creek, where a gossan vein carrying copper in large slug formation at about 26ft. from the surface was found, it was decided to discontinue any additional work in the older portion of the mine and thoroughly test this untried portion. Driving and crosscutting to the extent of 65ft. was then carried out, and two winzes sunk to depths respectively of 10ft. and 6ft., which gave the Directors a fair indication as to the best manner in which to proceed to carry out the development work and the further prospecting of the lode discovered. After due consideration it was decided to sink a new main shaft 7ft. by 4ft. inside timber, shaft to be vertical, situation 60ft. E. of prospecting shaft, so as to cut the lode at a depth, " the lode formation showing an Easterly underlie.'

Main Shaft or Prout's.—Sunk to 62ft. Four lodes have been traversed, the first at 28ft. 6in., the last at 50ft., all quartz lodes carrying pyrites and occasionally yellow ore in splashes. There is every indication that all these lodes junction at the E. of shaft. Bottom of shaft in blue slate.

The intervening country between these lodes is clay slate, and with a regular E. underlie for 50ft., at times 45 degrees. Water level is at 30ft., and when the pumps are in full work and the country thoroughly drained makes at the rate of 2,500galls. per hour, and easily kept down by one pump. The mine has a fair equipment of tools, smith's forge, windlass, wire rope, &c., and the pumping plant consists of 8 H.P. vertical boiler tested to 127lbs. per square inch water test; two Worthington pumps $3\frac{1}{2}$ x $5\frac{1}{4}$ x 5=combined, 8,000galls. per hour, and all necessary pipes and fittings.

At 57ft. a crosscut has been started W. for prospecting on Kappler's shaft, and is now in about 8ft. Went through schist carrying copper pyrites, decomposed felspar, and blue slate coming up, in bottom. Shaft is well timbered to 51ft., principally oregon.

The *Union Consolidated Copper Mines, No-Liability*, and the *Lyndhurst (S.A.) Copper Company, Ltd.*, have amalgamated their interests at Yudnamutana, and merged into the *Union Consolidated Copper Mines* (1911) *Limited*. Active operations are proposed at the mines, and work is being resumed on some of the leases.

The principal work in progress at the *Tumby Bay Copper Mine* is the sinking of the main shaft; this is 7ft. x 3ft., within timbers, and at the end of the year had reached a depth of 105ft. 6in.

At *Anabama* a few tons of ore, worth 26 per cent., were obtained.

Paull's Mine, worked in a small way, produced about 8 tons of copper.

A little ore has been raised at the *Trinity Copper Mine*, near Mutoroo.

At the old *Blinman Mine* a party of four men raised 71 tons of ore, worth $15\frac{1}{4}$ tons of copper.

From Windy Creek, *Parabarana*, about 8 tons of 25 per cent. ore were marketed

---

A little work was done at the *Diamond Jubilee*, near Leigh Creek.

Nothing was done at the *Burra*, and only a little tributing at the *Kapunda*.

At the *Gun* and *Gunyot* mines, near Penalty Lagoon, about 250 tons of lode material have been raised, and preparations made for future development.

The work of cleaning up and prospecting is in progress at the *Sweet Nell*, near Monalcena, from which a considerable quantity of copper ore has been taken in the past.

At the *Black Eagle*, from 116 tons of ore treated 9¼ tons of copper were obtained.

The following statement relative to the *Deloraine Gold Mines* has been furnished by the Secretary (Mr. J. K. Samuel), and detail returns of the ore treated will be found on page 16.

Some progress was made with the development of this mine during the half-year under review. Sinking was resumed in December, and the shaft deepened to 168ft., at which point the reef was 30in. wide, assaying 63s. per ton. The S. drive from No. 3 shaft at the 100ft. level was extended to 172ft., the reef in the end being 26in. wide, assaying 48s. per ton. This drive has also been timbered and stopes opened up for a length of 85ft. from main shaft. A drive S. from No. 7 shaft, which is about 600ft. S. from the main shaft, was put out 49ft., in ore the whole way, the reef in the end being 40in. wide, assaying 58s. per ton. The battery treated 760 tons of ore for a yield of 556ozs. 14dwts. gold from amalgamation, value £1,569 5s. 6d. and produced 22 tons concentrates of a value of £416 4s. 8d.—total value £1,985 10s. 2d., or an average of 52s. 6d. per ton. The extraction by amalgamation and concentration is equal to 82 per cent. The total production of the mine to date has been 1,420 tons, of a value of £4,948 7s. 10d., or an average value of 69s. 8d. per ton.

Interesting reports by the Inspector of Mines on *Tarcoola* and *Glenloth* will be found on pages 42-48. The reports deal in detail with *Tarcoola Blocks*, *Tarcoola Perseverance*, *Morning Star*, *Day Dawn*, and *Glen Markie*. The returns from the stone treated at the Tarcoola Government plant during the six months were very good and encouraging (*vide* page 14).

At *Wadnaminga* Mr. O. W. Allanson has installed a five-head battery of 1,100lbs. stamps, driven by a 28-h.p. petrol engine ; and also a 6-h.p. petrol engine for pumping. Samples of stone only have been treated so far, and it is intended in the near future to erect a cyanide plant.

The water has been laid on from the new well near Simon's well to the *Ajax Gold Mine*, now worked by the Babylonian Company, and crushing has restarted. No returns are to hand so far.

At *Kirkeek's Treasure*, 800 tons of tailings were cyanided for 181ozs. 9dwts. 10grs. of gold bullion worth £458 5s. 6d. A report by Inspector Jones will be found on page 51 ; and recently the Assistant Government Geologist has furnished a special report on this mine of a most encouraging nature.

No work is reported from the *Alma Extended* or the *Union Jack*.

No work is in progress at the *Westward Ho*, and the company is in liquidation.

Returns from the *New Medora* and *Mount Grainger* show that the battery on the mine has crushed 219 tons of stone for 73ozs. 8dwts., or an average of 6dwts. 17grs. per ton off the plates, and 560 tons of tailings have been cyanided for 77ozs. 4dwts. 19grs., or 2dwts. 18grs. per ton. The general summary of operations states that work has been done on the underlie at 90ft., where good payable ore was found. The drive at the 120ft. level has been extended 20ft. in the course of the lode. Winze at the 220ft. level has been cleaned out and the N. drive extended 40ft. South drive pushed on 30ft., and is to be continued to the Medora shaft. Jones's shaft has not been worked ; but this will be done later. A detail report by Inspector Jones will be found at page 39.

Not much work has been done at *King's Bluff*. The vertical shaft is still in progress, and 18 tons of stone were treated at the Petersburg Government plant for 10ozs. 5dwts. 1gr., value £33 1s. 3d.

A prospecting party was sent out by the *Western Exploration Syndicate* for the purpose of prospecting the country adjoining the known gold discoveries in the N.W., viz., Tarcoola and Glenloth. H. Fabian, a well known prospector is in charge, and at a point about one mile W. of the W. end of Lake Labyrinth a gold-carrying quartz reef was found and has been followed down to a depth of 55ft., with drives E. 20ft. and W. 23ft. along the reef. Twelve tons of stone, estimated to be worth over 1oz. of gold per ton, have been raised and will be treated at the Tarcoola Government Works.

Whether this particular find proves payable or not, the fact that the actual occurrence of gold has been demonstrated in a new portion of this immense north-western district is very satisfactory.

The tributers at *Kitticoola* have put 740 tons through their battery for 146½ozs. off the plates. The work done consisted of winze-sinking and ore-raising (*vide* Inspector of Mines' report, page 41).

In 1887 some gold was found at the *Bumbumbie Hill*, near Teetulpa. A small "rush" took place, but the alluvial was soon pronounced not payable, and a little reefing work was done subsequently. Inspector Jones has recently visited the locality, and his report will be found at page 50.

In August it was resorted that gold had been found in the Flinders Range at a place about 15 miles E. of Port Pirie. The Chief Insptctor of Mines paid a visit of inspection and was unable to find any justification for the report (*vide* page 39).

At the *Radium Hill Mine*, near Olary, a considerable quantity of ore has been raised. This is concentrated at the magnetic separator plant in the mine, and shipments of the concentrates forwarded regularly to the company's works at Woolwich on the Paramatta River, near Sydney. These works, which can now treat about 10 tons per week, have, it is stated, cost over £15,000. The directors report that "Pure radium bromide has been produced by Mr. Radcliff, and on the 26th November, 1912, Mr. Radcliff submitted 2½ milligrammes to Professor Pollock, of the Sydney University," and the following is a copy of his certificate :—"The material in a sealed glass tube handed to me by Mr. Radcliff has, according to the sample of pure radium bromide in my possession, a radio activity at noon, November 28th, 1912, equivalent to that of 1·38 milligrammes of pure radium bromide. Mr. Radcliff informs me that the material consists of 2·5 milligrammes of radium bromide, crystallized and sealed up at 8 p.m. on Saturday, November 23rd, 1912. On the basis of these figures the material is 98·4 pure."

"Although only 2½ milligrammes were fully prepared, it proves that radium bromide of a purity of between 1,800,000 and 2,000,000 radio activity can be procured from the company's ore, and there are, as per Mr. Radcliff's report, approximately 350 milligrammes of radium in the laboratory in various stages of purity, which will receive its final preparation and be available for sale automatically week by week henceforth. One hundred and twenty tons of concentrates have been smelted, of which 95 tons have been treated for about 350 milligrammes of radium, which is equivalent to an extraction of 3⅔ milligrammes per ton of concentrates."

The company also proposes to utilise the various by-products contained in the ore.

The South Australian Radium Proprietary holds leases adjoining and to the N.E. of the Radium Hill Company's property. Four shafts have been sunk, viz., 100ft., 70ft., and two of 30ft. A considerable amount of developmental work has been done ; 30 tons of ore have been forwarded to Europe as samples, and a fair quantity is at grass.

The Rare Metals Proprietary, working on claims held by Dr. Counter about 3 miles N.E. of the Radium Hill Mine, has done a considerable amount of prospecting work, and raised about 7 tons of lode material, analyses from which are satisfactory.

The Radium Extraction Company of South Australia, Mount Painter.—No work was done on this company's property during the period under review. The directors' report states that some good ore was picked out and dispatched before work ceased,

and one shipment of about 2¼ tons realised very satisfactory prices. The bulk of it, which assayed 2·02 per cent. U_3O_8, brought £22 per ton, but some picked specimens were sold at the rate of £550 per ton. Two other shipments of the total weight of about 7 tons, are now in course of realisation. The bulk of this is estimated to contain about 2 per cent. U_3O_8.

The Government Geologist inspected the workings in November and furnished a report (*vide* page 27). He recommended that at No. 6 workings exploration work be undertaken following the ore E. of the shaft, and it is understood that the company will carry this out.

The Mount Painter Radium Company.—Prospecting only has been done, and samples of corundum sent to Sheffield and Germany.

A find of very rich silver ore specimens in section No. 5, hundred Miltalie, in the Franklin Harbor district, by Mr. W. H. Atkinson in November caused a considerable amount of interest, and the Assistant Government Geologist (Mr. Jack), who was in the locality at the time, has furnished a report (*vide* page 34). A fine specimen from this find was purchased by the Government. The following are the particulars of it:—

Weight of specimen = 195½lbs.

Assay value = 6,800ozs. fine silver per ton.

Total silver contents of slug = 593·4ozs. fine silver = 641·5ozs. standard silver.

Valuation at 2s. $5\frac{5}{16}$d.* per ounce = £78 7s.

Mr. Jack has also reported on various mineral shows on Eyre Peninsula, viz.—*Tumby Bay Copper Mine; Flinders Lode; Sections* 94 *and* 95, *Hundred Yadnarie; Yalpoudnie; Section* 4, *Hundred Miltalie; Marowie; and Mount Millar* (*vide* pages 36-38).

A large number of licences to search for oil on Kangaroo Island, the southern part of Yorke Peninsula, and the south-western coast of Eyre Peninsula have been registered; but no returns as to operations have come to hand.

Wallin's original claim at the *Robertstown Bright Silver-Lead* find and three other adjoining claims have been formed into a company, which started work in November, and the secretary reports that at the end of the year 10 tons of marketable ore were at grass, the bulk assay being 2ozs. silver, 36 per cent. lead, and 29 per cent. zinc.

The Inspector of Mines has reported on the property (see page 48).

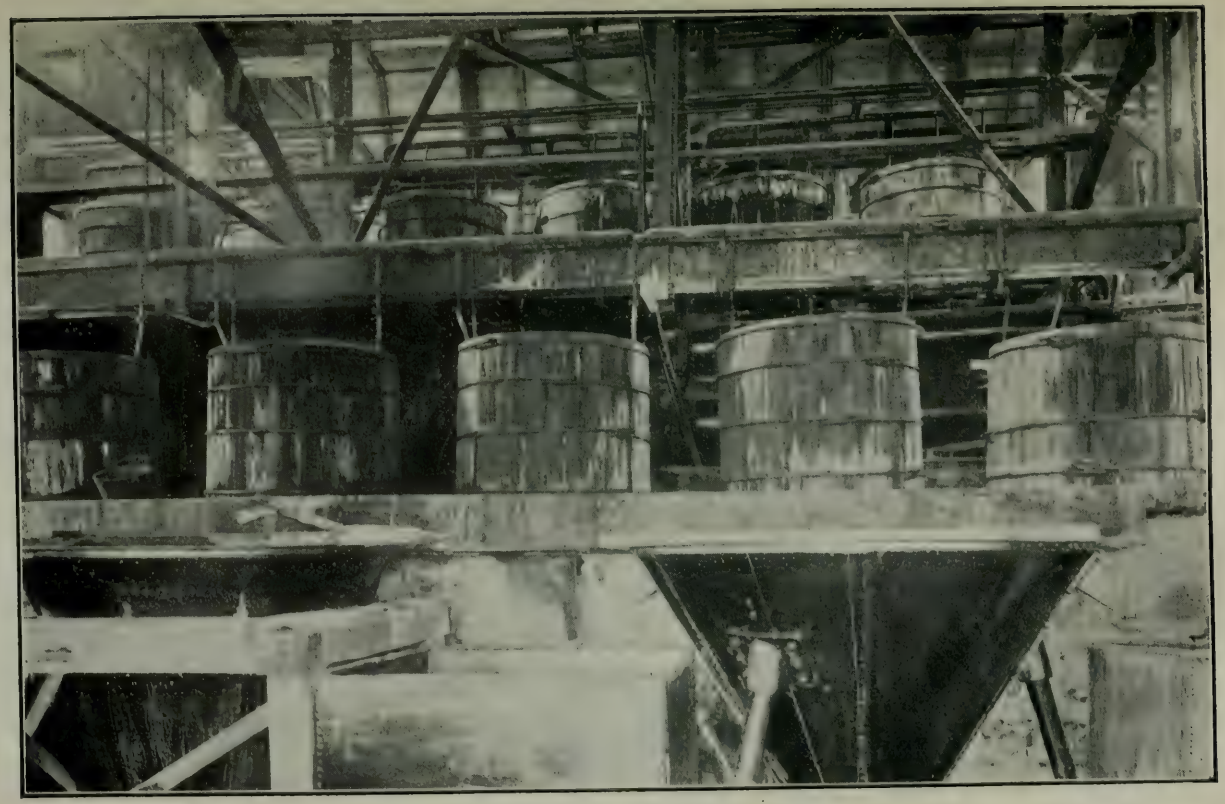
Gypsum. About the average quality of gypsum has been removed from the deposits in the southern portion of Yorke Peninsula.

* London quotation, 10/1/13, date of sampling.

To face p. 12.]

RADIUM HILL COMPANY'S WORKS AT WOOLWICH (SYDNEY), WHERE THE CONCENTRATES FROM THE MINE NEAR OLARY ARE TREATED.

To face p. 12.]



INTERIOR OF WORKS AT WOOLWICH.

More attention is being paid to the clay deposits at *Muloowurtie*, and boring and general prospecting are in progress.

The only work done on the *Asbestos* localities is the raising of a few hundredweights for experimental purposes.

Returns show only 5cwts. of *Wolfram* unearthed during the half-year.

A report by the Government Geologist on the *Mount Bessemer Iron Mine*, situated in the hundred of Barossa, E. from Gawler, will be found on pages 24-27.

Salt leases have been taken out on *Lake Hart*, about 140 miles N.W. from Port Augusta, and on the forthcoming East-West railway line.

The salt season, 1912, generally was a good one, but the wisdom of "spelling" some of the lakes has been made manifest.

The Australian Salt Company, Lake Bumbunga, hundred Cameron, has come into existence, and has been busy erecting buildings, making roads, laying tram lines, and preparing for the erection of a factory.

COPPER.

AVERAGE MONTHLY PRICE OF COPPER, JULY TO DECEMBER, 1912

	Standard. £ s. d.		Best Selected. £ s. d.
July	76 13 9	..	81 11 1
August	78 17 1	..	83 9 0
September	78 17 5	..	83 11 3
October	76 10 7	..	82 0 7
November	77 0 0	..	82 6 8
December	78 12 2	..	81 7 9
Average for the six months	77 5 2	..	82 7 9
RANGE OF PRICES—			
July 12th	73 6 3		
August 28th	79 17 6		

AVERAGE PRICE OF STANDARD COPPER FOR THE LAST TEN YEARS.

	£ s. d.		£ s. d.
1903	58 3 2	1908	60 0 10
1904	59 0 7	1909	58 17 2
1905	64 16 10	1910	57 3 3
1906	87 8 10	1911	56 1 10
1907	82 1 11	1912	73 1 3

Average for the 10 years, £65 13s. 7d.

CRUSHING AND CYANIDING PLANTS.

RETURNS FROM GOVERNMENT CRUSHING AND CYANIDING PLANTS FOR THE HALF-YEAR ENDED DECEMBER 31ST, 1912.

Name of Mine.	Locality.	Weight of Ore.	Gold Bullion Recovered.	Value of Gold.	Yield per Ton, in Shillings.
		Tons cwts. qr.	Ozs. dwts. grs.	£ s. d.	s.
TARCOOLA BATTERY AND CYANIDE WORKS.					
Tarcoola Perseverance	Tarcoola	104 0 0	130 11 6	502 14 5	96¼/-
Tarcoola Blocks.....	"	45 0 0	23 14 14	85 2 6	37¾/-
Tarcoola Blocks.....	"	28 15 0	56 13 3	168 10 11	117/-
Tarcoola Blocks.....	"	9 10 0	5 11 1	20 8 1	43/-
Day Dawn	"	25 0 0	10 5 12	32 15 0	26/-
Day Dawn	"	34 0 0	9 3 15	25 9 6	15/-
Morning Star.....	"	33 0 0	236 0 6	786 4 0	476½/-
Tarcoola Perseverance	"	100 0 0	157 3 12	615 18 9	123/-
Day Dawn	"	33 0 0	19 2 16	59 11 0	36/-
Day Dawn	"	50 0 0	21 4 23	63 16 8	25½/-
R. Watkins	"	10 0 0	4 2 19	12 6 7	24½/-
Tarcoola Blocks.....	"	10 0 0	9 13 20	29 15 0	59/-
Morning Star.....	"	48 0 0	121 9 7	404 7 7	168¼/-
Day Dawn	"	10 10 0	3 10 2	10 17 3	20¾/-
Eclipse	"	8 10 0	9 19 6	36 8 11	85¼/-
Tarcoola Perseverance	"	95 0 0	124 2 12	470 7 5	99/-
Total.....		644 5 0	942 8 6	3,324 13 7	103/-
Grand total since starting of battery ..		3,801 5 0	5,481 11 21	19,340 0 5	102/-

RETURNS FROM GOVERNMENT CRUSHING AND CYANIDING PLANTS—*continued.*

Name of Mine.	Locality.	Weight of Ore.	Gold Bullion Recovered.	Value of Gold.	Yield per Ton, in Shillings.
		Tons cwts. qrs.	Ozs. dwts. grs.	£ s. d.	s.
GLENLOTH BATTERY AND CYANIDE WORKS.					
Glenmarkie	Glenloth	26 0 0	22 15 4	83 8 2	64/-
Glenmarkie	"	28 0 0	14 18 16	56 10 11	40/-
Total		54 0 0	37 13 20	139 19 1	51¾/-
Grand total since starting of battery		1,832 10 0	1,936 5 12	6,498 2 3	71/-
MOUNT TORRENS GOVERNMENT BATTERY AND CYANIDE WORKS.					
Mount Torrens	Mount Torrens	38 5 0	5 3 12	18 13 10	9/¾
Sampson	Woodside	3 13 0	0 7 13	1 9 11	8/-
Mines	Mount Torrens*	80 0 0	3 16 16	15 6 8	3¾/-
Total		121 18 0	9 7 17	35 10 5	6/-
Grand total since starting of battery		10,070 11 3	5,880 1 10	22,273 18 3	44/-
PETERSBURG GOVERNMENT BATTERY AND CYANIDE WORKS.					
Wanda (Homeward Bound)	Mannahill	5 0 0	8 2 19	32 11 8	130/-
King Solomon's Mines	Olary	18 0 0	10 5 1	33 1 3	36¾/-
Mines	Petersburg*	70 0 0	4 1 16	16 6 8	4½/-
Only a Dream	Parnaroo	1 15 0	0 13 0	2 5 6	25¾/-
Total		94 15 0	23 2 12	84 5 1	17¾/-
Grand total since starting of battery		4,550 7 0	4,208 3 21	15,682 2 7	69/-

* Sands only.

RETURNS FROM CRUSHING AND CYANIDING PLANTS (OTHER THAN GOVERNMENT) FOR THE HALF-YEAR ENDED DECEMBER 31ST, 1912.

Name.	Ore Treated.	Gold Bullion Recovered.	Value.	Yield per Ton, in Shillings.
	Tons cwts. qrs.	Ozs. dwts. grs.	£ s. d.	s.
NEW MEDORA AND GRAINGER COMPANY, MOUNT GRAINGER.				
Battery	219 0 0	73 9 0	226 15 5	21
Tailings, Cyanided	560 0 0	77 14 19	295 5 3	10½
Total	779 0 0	151 3 19	522 0 8	13½

RETURNS FROM CRUSHING AND CYANIDING PLANTS, ETC.—*continued.*

Name.	Ore Treated.			Gold Bullion Recovered.			Value.			Yield per Ton, in Shillings.
	Tons	cwts.	qrs.	Ozs.	dwts.	grs.	£	*s.*	*d.*	*s.*
KIRKEEK'S TREASURE BATTERY, NILLINGHOO.										
Tailings, Cyanided	800	0	0	181	9	10	458	9	6	—
Total	800	0	0	181	9	10	458	9	6	11⅓
KITTICOOLA, REEDY CREEK.										
Battery treatment	740	0	0	146	10	0	439	0	0	—
Total	740	0	0	146	10	0	439	0	0	12

DELORAINE GOLD MINES.

Return of Ore Treated, &c., for Six Months ended December 31st, 1912.

No. of Tons Crushed.	Weight of Gold Obtained.	Weight of Copper Obtained.	Value of Gold.			Value of Copper.			Total.		
	Ozs.	Tons.	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d*
140	158·8	—	253	16	8	—			—		
135	59·9	—	141	11	8	—			—		
64	57·7	—	167	10	0	—			—		
76	52·2	—	187	9	4	—			—		
64	43·25	—	155	3	5	—			—		
31	20·65	—	71	16	9	—			—		
116	95·10	—	355	9	1	—			—		
134	71·10	—	236	8	7	—			—		
760	556·7	—	1,569	5	6	—			1,569	5	6
			CONCENTRATES.								
4·07	27·329	·1667	109	6	4	13	1	10	122	8	2
3·08	12·630	·1416	49	5	9	10	19	6	60	5	3
6·71	30·190	·4325	120	15	6	32	15	9	153	11	3
*8	20	·4	50	0	0	30	0	0	80	0	0
781·86	646·849	1·1408	1,898	13	1	86	17	1	1,985	10	2

* All this line estimated.

TOTAL BATTERY AND CYANIDE RETURNS FROM ALL PLANTS FOR SIX MONTHS ENDED DECEMBER 31ST, 1912.

Name.	Ore Treated.			Gold Bullion Recovered.			Value.			Yield per Ton, in Shillings.
	Tons.	cwts.	qrs.	Ozs.	dwts.	grs.	£	*s.*	*d.*	*s.*
Petersburg	94	15	0	23	2	12	84	5	1	18/-
Mount Torrens	121	18	0	9	7	17	35	10	5	6/-
Tarcoola	644	5	0	942	8	6	3,324	13	7	103/-
Glenloth	54	0	0	37	13	20	139	19	1	52/-
Deloraine	782	0	0	647	0	0	1,899	0	0	48½/-
Mount Grainger	779	0	0	151	3	19	522	0	8	13½/-
Kirkeek's Treasure	800	0	0	181	9	10	458	9	6	11⅓/-
Kitticoola	740	0	0	146	10	0	439	0	0	12/-
Total	4,015	18	0	2,138	15	12	6,902	18	4	34⅓/-

REPORTS ON BORING OPERATIONS.

BORING OPERATIONS AT THE YELTA MINE, MOONTA.

Report by Mr. A. W. Matthews, Foreman.

The boring has been confined to the Yelta Mine, and consists of continuing No. 1 bore from 617ft. to 800ft., also completing Nos. 2 and 3 bores to depths of 485ft. and 421ft.

No. 1 Bore, Yelta Mine.—(*Vide* Review No. 16, page 14.)

From 617ft. to 800ft. the drill continued in hard felsite porphyry, and as no indications of a lode were met with boring was discontinued.

No. 2 Bore, Yelta Mine.

Angle 50ft. in 100ft. Boring started August 13th with 3½in. bit.

Surface to 6ft. Loam and limestone.
6ft. to 27ft. Sandstone with small quartz veins.
27ft. to 103ft. Felsite porphyry.
103ft. to 109ft. Showing seams of mica.
109ft. to 114ft. 9in. Felsite porphyry.
114ft. 9in. to 117ft. 9in. Quartz lode; no value.
117ft. 9in. to 265ft. Broken country.
265ft. to 265ft. 8in. Ironstone seam.
265ft. 8in. to 383ft. Hard, broken felsite porphyry.
383ft. to 385ft. Small veins of yellow sulphide.
385ft. to 388ft. Showing specks of sulphide.
388ft. to 434ft. 7in. Felsite porphyry.
434ft. 7in. to 436ft. 7in. Quartz lode carrying hematite and yellow sulphide.
436ft. 7in. to 443ft. Showing a little iron pyrites.
443ft. to 476ft. Broken country.
476ft. to 476ft. 6in. Lode matter.
476ft. 6in. to 485ft. Broken felsite porphyry.

No. 3 Bore, Yelta Mine.

Angle 15ft. in 100. Boring started with 3½in. bit.

Surface to 4ft. Limestone.
4ft. to 13ft. Sandstone.
13ft. to 20ft. 6in. Quartz lode; no value.
20ft. 6in. to 31ft. 2in. Felsite porphyry.
31ft. 2in. to 33ft. 8in. Quartz lode; no value.
33ft. 8in. to 153ft. Grey country rock, showing a little iron pyrites at 153ft.
153ft. to 246ft. Grey and red country rock, mostly felsite porphyry.
246ft. to 246ft. 9in. Micaceous schist.
246ft. 9in. to 305ft. Hard country, small seam of tourmaline at 305ft.
305ft. to 336ft. Country.
336ft. to 337ft. 9in. Quartz; no value.
337ft. 9in. to 344ft. Country, small quartz seam.
344ft. to 353ft. Country.
353ft. to 368ft. Country showing iron pyrites and occasional specks of sulphide.
368ft. to 368ft. 9in. Lode matter showing a little yellow sulphide.
368ft. 9in. to 421ft. Hard felsite porphyry.

BORING OPERATIONS AT LEIGH CREEK.

Report by Mr. C. F. Duffield, Foreman.

(*Vide* Review No. 16, page 15.)

Boring operations at No. 1 bore were continued from 325ft. to 531ft., the country passed through being as under :—

From 325ft.
to Limestone.
335ft.
to Sandstone.
340ft.
to Drift sand, with small nodules of iron pyrites.
385ft.
to Soft grey slate.
423ft.
to Grey slate, with quartz veins.
455ft.
to Pink slate.
471ft.
to Drift sand.
474ft.
to Coarse sandstone country.
531ft.

At this depth boring was discontinued and the plant was shifted to a site 200ft S.W. of the old main shaft, and 400ft. back from the line of lode, to cut same at about 350ft., the angle of the bore being 30ft. in 100ft. Boring operations at No. 2 bore were started on September 2nd, using a 3½in. diamond bit to 70ft., then reduced to 3in. diamond bit to 370ft., and then reduced to 2⅝in. bit to 464ft., and then reduced to A bit to 651ft., the country passed through being as follows :—

Surface
to Surface, loam, rubble, and limestone.
11ft. 6in.
to Soft limestone country.
70ft.
to Hard limestone rock.
72ft.
to Ferruginous quartzite.
73ft.
to Calcite.
90ft.
to Solid broken limestone.
142ft.
to Pink slate country (very broken)
182ft.
to Limestone, with quartz veins, hard in places.
204ft.
to Hard limestone and slate country, with quartz veins.
214ft.
to Slaty formation.
245ft.
to Pink slate.
251ft.
to Kaolinised material.
258ft.
to Hard and broken limestone.
271ft. 6in.
to Soft slaty formation.
287ft.
to Hard limestone.
291ft.
to Blue slate.
297ft.
to Pink slate and sandstone conglomerate.
311ft.
to Kaolinised material.
321ft.
to Sandstone country.
326ft.
to Hard limestone.
330ft.
to Black drift sand.
333ft.
to Blue slaty formation.
368ft.
to Limestone.
385ft.
to Kaolinised matter.
430ft.
to Sandstone and kaolinised material.
464ft.
to Sandstone with occasional quartz veins.
651ft.

At this depth operations were stopped. Total boring for half-year, working one shift, being 857ft.

PARAMATTA AND YELTA COPPER MINES.

Report by Mr. Frank Richards, Mine Manager.

I beg to submit the following report of operations at these mines for the six months ended December 31st, 1912 :—

Underground operations were confined chiefly to developing and mining of the main lode at Yelta Mine, and further exploration of the lodes at No. 1 prospecting shaft.

At the Yelta Mines the prospecting drives have so far failed to locate another payable ore body, but the development of the main ore chute has been much more satisfactory.

Considerable quantities of payable ore have been located in hitherto doubtful areas, and although the newly developed ground is somewhat lower in copper it is quite safe to regard the whole of the block of ground below No. 10 level South contents than that now being operated upon, yet, with the present price of copper, as payable ore, for at least the entire length of the Southern ore chute.

A new stoping block was also revealed in the rising and sinking between No. 4 and 3 levels, and a careful survey of the present ore reserves shows no falling off as compared with those of six months ago.

It is to be greatly regretted that continued difficulties with the smelting operations necessitated a delay with the work of developing the lodes at No. 1 prospecting shaft, where during the period under review very encouraging results were obtained.

The workings in those parts now consist of a vertical shaft, 200ft. deep, connected by crosscuts to a newly-discovered lode to the west of the main workings, and a crosscut connection to the continuation of the Yelta main lode.

In driving on the course of the Yelta lode, south of the crosscut, a small seam of exceedingly rich ore was intersected which promised in depth to develop into a payable ore body.

Further prospecting of this new discovery will be done by driving from the main workings of the Yelta Mine, and a contract for 200ft. of driving was recently arranged.

The diamond drill has been set at work testing the lodes to the east of the main workings, but only in one hole was anything of note discovered, and this was not considered of sufficient importance to warrant reopening the old abandoned workings.

After many delays and considerable expense, a successful smelting campaign inaugurated in November last, and to the end of the year 2,243 tons of Yelta ore were treated, assaying 5·56 per cent. of copper, for a yield of 263 tons of copper matte, containing 73ozs. of gold, valued at £4,847, in addition to furnace bottoms and cleanings yet to be realised on.

The mine records show that during the past six months 3,561 tons of crude ore have been raised, and there are 1,360 tons of prepared smelting ore at the furnace awaiting treatment.

The details of prospecting and development work done is as follows :—

	Ft.	In.
Development—		
Driving	81	0
Rising	191	0
Sinking	71	0
Prospecting—		
Driving	231	10
Rising	41	6
Crosscutting	39	0

SUBSIDIES.

The Legislature provided in the Mining Act, 1893, and in previous measures for the encouragement of Mining.

The following schedule shows what subsidies have been paid from the inception of the system to December 31st, 1912, and the sums repaid. In the ordinary way these repayments are made from profits—50 per cent. of such profits being devoted to repayments. In two instances only have the profits won enabled full repayments to be accomplished—the Crystal Mine, at Echunga, which repaid £76 7s. 6d. from that source, and the once-famous New Alma and Victoria Mine, Waukaringa, which repaid in full the first subsidy, £3,000. The remainder of the recoveries was derived from sales of mining plant held as security. The total subsidies advanced is £57,118 11s. 3d. of which £7,170 has been recovered, leaving a debit balance of £49,948 11s. 3d. Portion of this outstanding debt is represented by machinery that has fallen into the hands of the Government; add to this the value of the metals won, and the State in general will probably have benefited beyond the money value of the debit balance.

STATEMENT OF SUBSIDIES PAID FROM COMMENCEMENT TO DECEMBER 31ST, 1912.

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced.	Amount Repaid.
		£ s. d.	£ s. d.
Adelaide Crushing, Grinding, and Amalgamating Mill Co.	—	100 0 0	—
Algebuckina Gold Mining Syndicate	Algebuckina	52 10 11	52 10 11
Alma Extended Gold Mining Co.	Waukaringa	3,000 0 0	172 5 0
Backhouse, T. S.	Worturpa	100 0 0	—
Barossa Enterprise Gold Mining Coy.	Barossa, Hundred of	232 2 6	—
Belalie Copper Mining Syndicate	Bundaleer	392 12 3	—
Beltana Rapid Ore Treatment Syndicate	Near Beltana	296 8 4	—
Bevilaqua & Angel	Palmer (near)	57 18 0	—
Bird-in-Hand Gold Mining Co, Ltd.	Woodside	3,000 0 0	—
Blackfellow's Creek Gold Mining Co., Ltd.	Kuitpo, Hundred of	660 6 7	35 0 0
Callington Copper Mining Co.	Callington	148 8 7	—
Cockburn Copper Mining Co., N.L.	Mutooroo	273 18 5	173 13 8
Commonwealth Silver-lead Co., Ltd.	Strathalbyn, Hund. of	750 0 0	52 17 9
Copper Hill Mining Co., N.L.	Kadina	391 15 0	115 0 0
Cornwall Copper Mining Syndicate, N.L.	Kadina, Hundred of	500 0 0	—
Countess of Jersey Gold Mining Co, N.L.	Wadnaminga	321 0 0	—
Currency Creek Copper Mining Co.	Currency Creek	28 6 5	20 0 3
Crystal Gold Mining Co.	Echunga	563 17 6	176 7 6
Ding Dong Copper Mining Syndicate	Kanmantoo, Hund. of	124 0 4	—
Duke of Cornwall Gold Mining Syndicate	Mount Pleasant	458 17 4	43 10 0
Eagle Silver Mining Co, Ltd.	Glen Osmond	500 0 0	—
Echunga Proprietary Hydraulic Gold Sluicing Co., N.L.	Echunga	500 0 0	20 0 0
Ediacara Consols Silver Mining Co., N.L.	Ediacara	651 12 1	465 17 0
Enterprise Copper Mining Co., N.L.	Barossa, Hundred of	150 0 0	9 16 0
Enterprise Excelsior (Barossa Amalgamated)	"	2,000 0 0	—
Eureka Gold Mining Co., Ltd.	Woodside	1,500 0 0	—
Fifth Creek Central Silver and Copper Mining Co., N.L.	Fifth Creek	253 2 4	—
Fortress Hill Mining Syndicate	Fortress Hill	60 0 0	—
Glenloth Mining, Battery, & Options Co., N.L.	Glenloth	515 4 7	515 4 7
Glenloth Wells Pioneer Blocks Co., Ltd.	"	100 0 0	22 18 5
Gumeracha Gold Mining Syndicate	Gumeracha	75 0 0	—
Golden Point Claims	Wonna	50 0 0	—
Great Ironclad Gold Mining Co.	Teetulpa	218 6 9	—
Hakendorf, C. H., and Williams, J. (Glenmarkie Mine)	Glenloth	221 17 6	—
Hamley Copper Mining Co.	Wallaroo	2,000 0 0	—
Homeward Bound and Klondyke Gold Mines, N.L.	Mannahill	192 17 1	—

STATEMENT OF SUBSIDIES PAID—*continued.*

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced. £	s.	d.	Amount Repaid. £	s.	d.
Hunter Bros. (Lady Millicent Mine)	Mochatoona	100	0	4	—		
Ireby Gold Mining Syndicate	Mount Grainger	35	4	3	—		
Kirkeek's Treasure Gold Mining Co.	Waukaringa	691	8	1	—		
King's Bluff G.M. Co., N.L.	Olary	622	0	8	—		
Kohinoor Gold Mining Co., N.L.	Kangaroo Island	100	0	0	—		
Kohinoor Mine (H. G. Taylor)	"	200	0	0	—		
Lady Alice Gold Mining Co.	Barossa, Hundred of	1,797	2	3	—		
Lady Franklin Syndicate	Port Lincoln	200	0	0	40	0	0
Leigh's Creek South Coal Mining Co., N.L.	Leigh's Creek	95	16	4	95	16	4
McMurtie's Claims	Kuitpo, Hundred of	199	19	11	—		
Mingary Gold Mining Co.	New Luxemburg	400	0	0	—		
Montacute Gold and Copper Mining Co., N.L.	Sixth Creek	327	3	3	—		
Mount Victoria Mine	Bimbowrie	50	0	0	—		
Mount Malvern Silver Mining Co.	Blackwood	491	3	6	—		
Mount Malvern Silver-lead Mining Co., N.L.	Clarendon	1,347	15	3	—		
Mount Pangæus Gold Mining Co.	Hahndorf (near)	56	1	4	—		
Mount Monster Gold Mining Syndicate	Kuitpo, Hundred of	350	0	0	1	0	0
Mt. Grainger Ironclad Gold Mining Syn., Ltd.	Mount Grainger	21	18	10	—		
Mount Torrens Gold Mining Co.	Mount Torrens	1,000	0	0	—		
Mount Remarkable Mining Co., Ltd.	Wongyarra, Hund. of	122	8	1	15	0	0
Musgrave Ranges Prospecting Association	Musgrave Ranges	47	2	9	—		
Mount Painter Corundum and Gem Syndicate	Mount Painter	47	3	1	—		
Morning Star Gold Mining Co.	Teetulpa	68	4	6	—		
Mutooroo Copper and Silver Mining Co., Ltd.	Mutooroo	500	0	0	500	0	0
Nackara Proprietary Copper Mining Co, N.L.	Nackara	100	0	0	—		
Nackara Proprietary Gold Mining Syndicate.	Nackara	100	0	0	—		
New Banksia Gold Mining Syndicate	Nairne	250	0	0	—		
New Alma and Victoria Gold Mining Co., Ld.	Waukaringa	3,000	0	0	3,000	0	0
New Ajax Consolidated Gold Mining Co., N.L.	"	750	0	0	—		
New Era Gold Mining Co., Ltd.	Woodside	1,000	0	0	—		
New Glenloth Battery and Mining Co., N.L.	Glenloth	750	0	0	—		
New Medora and Grainger Gold Mines Syn., N.L.	Mount Grainger	1,136	2	11	—		
New Mingary Gold Mining Co.	New Luxemburg	250	0	0	—		
New Mount Grainger Gold Mines, N.L.	Mount Grainger	393	7	1	220	0	0
Northern Mining and Smelting Co., N.L.	Mount Fitton	350	0	0	—		
North Nairne Gold Mining Co.	Nairne	500	0	0	—		
North-West and West Australian Pros. Co.	North-west of S.A.	104	9	7	—		
North-West Prospecting Association, N.L.	Tarcoola	150	0	0	—		
Nil Desperandum Teetulpa Devt. Co., N.L.	Teetulpa	64	14	4	20	5	6
Nilpena Copper Mining Co., Ltd.	Blinman	290	5	3	—		
Onkaparinga Dredging and Mining Co.	Biggs' Flat	550	0	0	279	14	11
Paull's Consolidated Copper Propy., N.L.	Burr Well	525	0	0	11	5	0
Parara Mining Co., N.L.	Maitland	571	3	6	—		
Paringa Mining Syndicate	Callington	399	16	8	244	0	0
Paringa and West Kanmantoo Consolidated Copper Mine, N.L.	"	1,144	3	4	—		
Pioneer Gold and Copper Mining Syndicate	"	95	15	6	—		
Polmear, W. J. L.	Kadina	800	0	0	—		
Queen Bee Mining Co., N.L.	New Luxemberg	250	0	0	250	0	0
Quorn Manganese and Silver Mining Co.	Quorn	10	9	10	—		
Rapid Bay Silver Mining Co., N.L.	Yankalilla, Hund. of	136	2	4	—		
Royal Charlie Gold Mining Co.	Mannahill	153	18	5	—		
Rees, R., Ajax Mine	Waukaringa	604	14	5	—		
Stainbank, A. T.	Fifth Creek	70	14	11	—		
Sliding Rock Copper Proprietary, N.L.	Sliding Rock	2,000	0	0	25	7	0
Tarcoola Blocks Gold Mining Co., Ltd.	Tarcoola	3,995	5	2	150	19	11
Tarcoola Enterprise Gold Mining Co., N.L.	"	100	0	0	19	10	4
Tarcoola Proprietary Gold Mines, N.L.	"	150	4	4	9	15	
Teatree Gully Gold Mining and Pros. Assn.	Teatree Gully	234	5	7	—		
Teetulpa Mining and Crushing Co.	Teetulpa	349	11	4	—		
Teetulpa Prospecting Syndicate	"	49	15	6	—		
Tumby Bay Copper Mining Co., N.L.	Hutchison, Hund. of	400	0	0	—		
Victoria Hill Amalgamated Gold Mining Syn.	Barossa, Hundred of	38	12	6	—		

STATEMENT OF SUBSIDIES PAID—*continued.*

Name of Company or Person to whom Subsidy Granted.	Locality.	Amount Advanced.			Amount Repaid.		
		£	s.	d.	£	s.	d.
Victoria Tower Mining Co., N.L.	Mannahill	345	18	9	90	0	0
Warrakimbo Propy. Copper Mining Synd.	Barndioota, Hundred of	220	16	2	—		
Warra Warra Propy. Copper Mines, N.L.	Farina	322	4	11	322	4	11
Watt's Gully Gold Mining Co.	Gumeracha	50	0	0	—		
Watt's Gully Reef Claims	Gumeracha	50	0	0	—		
Wolters, F. C., & Co	Echunga	25	0	0	—		
Wallaroo Central Mining Co., N.L.	Kadina	500	0	0	—		
Westward Ho Mine (Dr. H. Dixon)	Mannahill	1,000	0	0	—		
Wohler, H., & Co.	Myponga	20	0	0	—		
Wheal Turner Copper Mining Co., Ltd.	Prospecting on proposed line to Queensl'd Border	1,000	0	0	—		
Winninninnie Gold & Silver Propy. Co., N.L.	Winninninnie	86	3	6	—		
Woodside Boring and Mining Syndicate	Woodside	422	17	11	—		
Worturpa Exploration and Mining Co., Ltd.	Worturpa	800	0	0	—		
Yelta New Copper Mining Co, N.L.	Wallaroo	1,000	0	0	—		
Young Bullfinch Gold Mining Co., N.L.	Talunga, Hundred of	146	3	4	—		
Totals	—	57,118	11	3	7,170	0	0

ACCIDENTS IN MINES AND QUARRIES.

A gratifying feature of our mining operations in mines and quarries is the infrequency of serious accidents. Act No. 858 of 1904, bringing quarries in the same category as mines as regards the control of the Chief Inspector of Mines has been effective in safeguarding the interests of quarry-men. The following table gives the number of accidents in mines and quarries since passing of the Act:—

ACCIDENTS IN MINES AND QUARRIES.

Accidents in Mines.				Accidents in Quarries.			
Year.	Total Number of Accidents Reported.	Number of Persons Injured.	Number of Persons Killed.	Year.	Total Number of Accidents Reported.	Number of Persons Injured.	Number of Persons Killed.
1904	5	1	4	1904	1	1	1
1905	3	1	3	1905	—	—	—
1906	5	—	3	1906	1	1	—
1907	8	4	6	1907	3	1	2
1908	5	4	1	1908	—	—	—
1909	6	5	1	1909	1	1	—
1910	5	3	3	1910	2	1	1
1911	2	—	2	1911	—	—	—
1912	3	2	1	1912	2	—	2

ASSAYS AT SCHOOL OF MINES.

NUMBER OF ASSAYS MADE FOR PUBLIC PURPOSES AT THE SCHOOL OF MINES ASSAY DEPARTMENT DURING THE SIX MONTHS ENDED DECEMBER 31ST, 1912.

	1912.					
	July.	August.	Sept.	October.	November.	December.
Department of Mines	20	78	114	123	74	106
Public assays	142	107	83	147	88	73
Totals	162	185	197	270	162	179

DECENNIAL RETURN SHOWING OUTPUT AND VALUE OF VARIOUS METALS AND MINERALS PRODUCED IN SOUTH AUSTRALIA SO FAR AS CAN BE ASCERTAINED.

Year.	Gold.		Silver.		Silver Lead Ore.		Copper.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Ounces.	£	Ounces.	£	Tons.	£	Cwts.	£
1903	8,650	28,650	7,086	804	211	1,267	129,812	417,116
1904	17,897	76,025	—	—	—	—	125,560	382,356
1905	10,983	45,853	—	—	—	—	130,959	426,511
1906	8,037	27,000	801	104	—	—	164,160	718,609
1907	5,609	20,540	5,845	780	1,000	11,000	158,620	690,000
1908	2,908	12,300	—	—	900	9,000	112,554	338,000
1909	7,111	30,206	1,660	167	70	416	113,940	334,584
1910	6,603	28,000	6,250	625	25	22	102,040	306,120
1911	3,537	15,000	1,400	140	—	—	118,440	332,500
1912	6,592	28,000	2,700	326	—	—	125,900	461,500
Totals....	—	311,574	—	2,946	—	21,705	—	4,407,296

Year.	Copper Ore and Regulus.		Lead.		Ironstone Flux.		Limestone Flux.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Cwts.	£	Tons.	£	Tons.	£
1903	7,069	54,922	14,408	8,799	84,932	46,712	—	—
1904	3,051	24,597	—	—	46,687	27,091	43,440	6,516
1905	2,563	28,434	1,040	369	84,483	48,577	44,498	4,791
1906	—	—	1,000	550	75,226	33,852	31,940	4,791
1907	—	—	—	—	84,600	38,100	31,100	5,800
1908	—	—	—	—	88,000	39,600	29,500	6,000
1909	1,230	4,003	140	90	16,120	8,296	13,765	2,464
1910	—	*9,350	400	260	46,200	21,945	18,600	3,720
1911	—	*11,103	—	—	42,300	26,400	28,700	7,175
1912	—	*10,192	—	—	42,200	26,375	50,600	12,500
Totals	—	142,601	—	10,068	—	316,988	—	53,757

Year.	Phosphate Rock.		Crude Salt.		Other Metals and Minerals.	Total Value.
	Quantity.	Value.	Quantity.	Value.	Value.	
	Tons.	£	Tons.	£	£	£
1903.....	1,000	1,000	40,000	12,000	100	571,371
1904.....	3,000	3,000	40,000	12,000	198	531,783
1905.....	5,000	5,000	32,500	13,000	1,261	573,796
1906.....	5,850	5,850	55,000	27,500	2,209	820,465
1907.....	8,000	8,000	75,000	37,500	2,500	814,220
1908.....	11,000	11,000	75,000	37,500	4,500	457,900
1909.....	3,772	3,697	51,407	25,594	3,873	413,390
1910.....	5,200	5,200	54,000	27,000	†13,600	415,342
1911.....	5,800	5,800	65,000	40,600	†11,319	450,054
1912.....	6,100	6,100	64,300	40,187	†10,490	595,670
Totals	—	54,647	—	272,881	50,050	5,644,491

* Bluestone, £5,980; Sulphuric Acid, £3,370.
" £4,163 " £6,940.
" £2,550 " £7,642.

† Including Gypsum, £9,000; Pyrites, £3,270.
" £7,275; " £2,580.
" £9,000.

REPORTS

BY

The Government Geologist (L. Keith Ward, B.A., B.E.)

THE MOUNT BESSEMER IRON MINE.

Locality.

The lodes of iron ore with which this report is concerned are situated near the boundary between the hundreds of Barossa and Para Wirra, the principal lode crossing that boundary at the confluence of Victoria Creek and the South Para River.

That portion only of the lode system which lies on the N. side of the South Para River is now held under mineral lease. The three mineral leases 2079, 2080, and 2081 comprise an area of 108 acres, and occupy portions of the sections 166, 169, 170, 171, and 176, in the hundred of Barossa.

History of Development.

The main lode has long been known, and it has been worked from time to time as a source of iron flux. The mining for flux has been unsystematic, and a considerable number of excavations have been made at various points along the outcrop. From the largest of these openings, usually referred to as the "Big Face," some 12,000 tons of ore have been removed—as far as may be judged from the dimensions of the excavation. It does not appear probable that more than 40,000 tons of iron ore have been removed from the lode over its entire length.

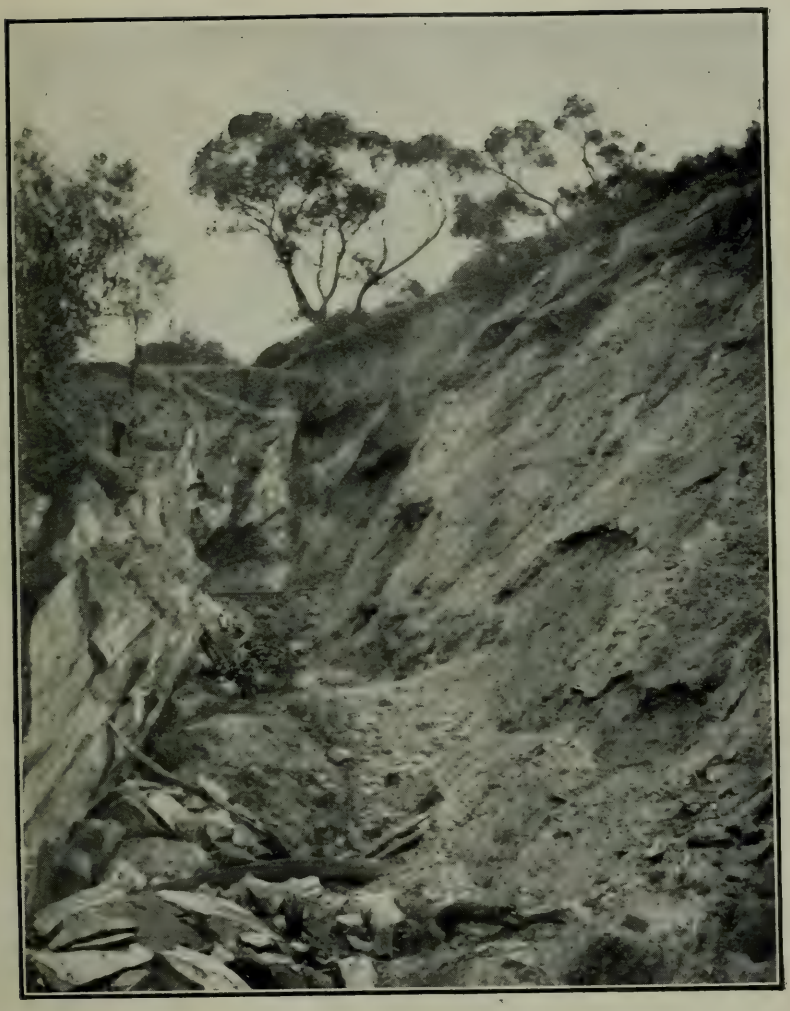
Some experimental smelting of the ore was attempted many years ago, and pig iron is reported to have been actually produced at Gawler. But the quantity tested was small, and no further attempts were made to utilise the ore as a source of iron. This being so, it is not a matter for surprise that no effort has been made to pierce the lode across its width at a number of places in order to provide accurate data for the estimation of quantities. The amount of work to be done to give this information is not large, as short tunnel crosscuts could be inexpensively driven on the levels of existing benches. The workings now open for observation are superficial and are located in all cases upon the hanging-wall side of the principal lode, since that portion has been most accessible, and the open cast working has hitherto involved very little stripping of overburden.

Geology.

The ore body which constitutes the main lode has certainly been formed by the more or less complete replacement of a series of tilted sedimentary rocks, with the dip of which it conforms in a general way.

The iron-bearing material is hæmatite in all cases, save where hydration at the surface has resulted in the formation of an insignificant amount of limonite. The variety of hæmatite represented is that known as specularite, and in most of the excavations the micaceous form of this variety is abundantly represented.

Intimately associated with the hæmatite are present quartz pebbles and some argillaceous material, both of which represent the undigested residues of the beds of sediment which have suffered replacement. In the majority of the exposures the undigested matter is disseminated through the iron ore ; but in the tunnel on the bank of Victoria Creek, at the S. boundary of mineral lease 2081, there is a well-defined inclusion of country rock, *i.e.*, a "horse," the contents of which are to be discarded in mining.



THE BIG FACE, MOUNT BESSEMER IRON MINE, LOOKING SOUTH.

To face p. 24]

Small veinlets of quartz extend outwards from the iron lode into the country rock on the hanging-wall side. These veinlets are approximately perpendicular to the plane of the lode.

The principal lode extends N. for a distance of 29 chains from the S. extremity of the leases. To the N. of this lode, and 9½ chains distant from its N. extremity, there lies another lode of similar material which may be traced on the surface for 7 chains. There is a still more N. outcrop of low-grade iron ore on the W. boundary of mineral lease 2079.

These three lodes appear to be parts of one lode system, the components of which are disposed *en echelon*.

The former of the two last-mentioned outcrops has been worked to a small extent, but the grade of ore exposed is not so high as that in the principal lode to the S.

The main lode extends beyond the limits of the area held under mineral lease, and was traced S. for a distance of 30 chains from the South Para River. Beyond this point the outcrop was not followed. Very little work has been done upon this S. extension of the lode, since the outcrop does not rise to such heights above the river level as it does within the mineral leases to the N., and the tonnage to be obtained from open cuts is correspondingly smaller.

The width of the lode cannot be exactly determined for lack of the necessary exposures. The outcrop varies very considerably in width on account of the comparatively low angle of dip and the relation of the ore body to the topography. Where the overburden of sedimentary rocks has not been removed by denudation the outcrop is narrow, but where extensive natural stripping of the overburden has occurred the outcrop is broad.

Existing exposures show the lode to have a width of at least 16ft., and that at some points this width is exceeded. For the purpose of calculation of tonnage it appears that the width of 16ft., measured at right angles to the dip-plane, may be reasonably taken as the average smallest dimension of the lode. It may be that future prospecting operations will extend this estimated average width with the possible addition of another 25 per cent.

The strike of the principal lode is, when the whole length is taken into consideration, 10° W. of N., and that of the larger of the two ore bodies in mineral lease 2079 is 38° W. of N. The dip is in each case to the E., and the angle of dip varies from point to point between 40° and 50°.

There has apparently been a small amount of displacement of the lode at a period subsequent to its formation, but only portions of the ore body are affected, and the general continuity of the lode is beyond doubt. There is apparently a fault plane at the N. end of the Big Face, which truncates the hanging-wall side of the lode. Its strike is 10° E. of N., and its dip 76° towards the E. The exposure of this fault is only a small one, but it does not appear to affect the continuity of the lode either to the N. or to the S. It is possible that this fault is related to the lode channel and that it actually antedates the period of ore formation, but further exposures are necessary before the matter can be definitely proved. A small overthrust fault, marked by the displacement of the quartz veinlets by a few inches, is visible in the hanging-wall country at this place. On the S. bank of the South Para River there is a duplication of the outcrop of similar lode matter which appears to be due to a normal strike fault with a W. dip.

The outcrop of the main lode within the Mount Bessemer mineral leases follows the E. flank and crest of a ridge which extends N. from the point of confluence of the South Para River and Victoria Creek. The ridge rises steeply from creek level, and the most N. portion of the outcrop attains an altitude of 150ft. above the level of the creek. The mean altitude attained by the outcrop along the face and crest of the ridge may be taken as about 100ft. above creek level. Making allowance for the dip of the lode, and measuring the height of the outcrop along the plane of the lode in the direction of the dip, an average value of 140ft. is obtained.

From the dimensions given the cubic contents of the main ore body within the Mount Bessemer leases and above the level of the Victoria Creek may be ascertained.

It is 16 (width) x 140 (height) x 29 x 66 (length) cubic feet.

Taking 8 as the number of cubic feet of ore to the ton—

$$\text{The gross tonnage above creek level} = \frac{16 \times 140 \times 29 \times 66}{8} = 535{,}920 \text{ cub. ft.}$$

This quantity of, say, half a million tons represents that portion of the main lode which is most readily accessible for mining, being above the level of the natural surface drainage of the district.

There is no doubt in the mind of the writer but that the ore body is continuous in depth, but the deeper extension of the lode must be proved at a number of points along its course by boring before a reliable estimate of the reserves of ore at a depth can be framed. One such bore has been drilled from a point opposite the Big Face, but the exact details with respect to it are not available.

There will be a considerable amount of overburden to be removed from the lower slopes of the ridge along which the outcrop runs if an open cut is to be carried down to creek level. Below that level the mining must inevitably be underground, and special provisions must be made to cope with the water of Victoria Creek and the South Para River.

The estimates given above of the ore which lies above the creek level are concerned only with the total bulk. It is impossible, from the existing exposures to give separate estimates of various grades of ore.

A number of samples were carefully taken at the various workings, and serve to show the composition of the ore at those points. As far as may be judged the samples represent typical ore.

The samples, of which the assay returns are given below, were taken over various widths at spots thus briefly described—

Nos. 1–4. Mouth of tunnel on bank of Victoria Creek, near S. boundary of mineral lease 2081.

No. 1. Footwall side of exposure. Width sampled 2ft. 6in.
No. 2. Lode-matter adjoining No. 1. Width sampled 3ft.
No. 3. Central portion of lode. Width sampled 5ft.
No. 4. Hanging-wall side of lode. Width sampled 3ft.

No. 5. Open cut on hanging-wall side of lode in mineral lease 2080. Width sampled 10ft.

No. 6. Open cut in central portion of mineral lease 2081. Width sampled 10ft.

Nos. 7–9. Big Face, in N. portion of mineral lease 2081—

No. 7. Footwall exposed at N. end of Big Face. Width sampled 6ft.
No. 8. Hanging-wall side of lode at same place. Width sampled 7ft.
No. 9. Short tunnel in footwall, centre of Big Face. Width sampled 10ft.

Analyses by Mr. W. S. Chapman, Departmental Analyst.

	Number of Sample.					
	1	2	3	4	5	6
Iron	60·3	54·5	51·9	40·8	53·3	56·4
Silicia	9·3	16·4	20·7	37·1	18·3	13·4
Phosphorus	0·04	0·07	0·04	0·04	0·07	0·06
Gold	nil	nil	nil	nil	nil	nil

Analyses by Mr. W. S. Chapman, Departmental Analyst—continued.

		Number of Sample.		
		7	8	9
	Water at 100° C. ..... H_2O	0·04	0·05	0·07
	Water above 100° C. ..... H_2O	0·28	0·33	0·43
	Silica ..... SiO_2	9·04	11·83	29·08
	Alumina ..... Al_2O_3	2·37	2·81	3·28
(1)	Ferric oxide ..... Fe_2O_3	86·83	83·41	64·57
(1)	Ferrous oxide ..... FeO	0·50	0·92	1·00
	Lime ..... CaO	0·02	0·04	0·08
	Titanic dioxide ..... TiO_2	0·37	0·46	1·11
(2)	Phosphoric anhydride ..... P_2O_5	0·07	0·06	0·20
	Sulphur ..... S	0·02	0·02	0·08
	Manganese oxide ..... MnO	nil	nil	nil
	Vanadium pentoxide ..... V_2O_5	nil	nil	present
	Gold ..... Au	nil	nil	nil
		99·54	99·93	99·84
(1)	Containing metallic iron ..... Fe	61·17	59·10	45·93
(2)	Containing phosphorus ..... P	0·03	0·03	0·09

THE MOUNT PAINTER DISTRICT.

The Area Investigated.

The following advance report deals with a portion of the Flinders Range in the vicinity of Mount Painter, which is one of the most prominent peaks of that range, and lies 65 miles a little S. of E. from Farina.

The area examined is that to which a considerable amount of public attention has been attracted by the discoveries of uranium-bearing minerals, corundum, apatite, monazite, and turquoise. Of these commercially valuable minerals those carrying uranium have been the principal objects towards which mining and prospecting operations have been directed, and the area with which this report deals is essentially that in which the uraniferous ores are now known to occur.

Geological Features of the Area.

The whole of the area under examination exhibits no little complexity of structure, and therein differs from the greater part of the Flinders Range which lies immediately to the W.

The district with which this report deals is characterised by an abundant development of intrusive igneous rocks and lode formations rich in iron and silica, while the country to the W. is in the main composed of folded sediments of Cambrian age.

It is probable that some at least of the altered sediments associated with the intrusive igneous rocks of the Mount Painter district are also of Cambrian age, but their exact correlation with the more W. rocks has not been effected.

Within the area affected by the numerous intrusions of granitic and pegmatitic dykes a considerable amount of metamorphism has been developed. The mineral constituents of the sediments have suffered reconstitution, and the molecular rearrangement has resulted in the formation of minerals such as corundum, not to

be found in the unaltered sediments. In other places fresh mineral material has been introduced by the intrusive processes, and in most of such cases there has been a considerable degree of induration produced. Hence the topographical features of this portion of the Flinders Range are rugged and bold, and differ in a pronounced manner from those of the hills which lie to the W.

The full extent of the complex geological unit with which this report deals was not determined. It extends N. at least as far as Yudnamutana.

The geological features of this district resemble, in the abundant presence of the pegmatitic dykes, those of the other parts of South Australia in which radio-active minerals are known to occur.

The only other locality in which torbernite and autunite are known to exist is situated near the Government weir across Yeldulknie Creek, in the neighborhood of Cleve. At this place the uranium-bearing minerals have been found in traces in joint planes traversing a pegmatitic intrusion.

The carnotite ore of Olary occurs in a region within which numerous pegmatitic intrusions are known to occur. The lode matter in the Moonta district has been found to be radio-active at two places. The pegmatitic character of the ore bodies of this field has already been indicated by the Geological Survey of South Australia.

Economic Geology.

The lodes carrying the radio-active minerals are far from simple, whether structure or mineral constitution are considered, and these complex characters have caused no small amount of difficulty in the prospecting of their contents.

The assemblage of minerals with which the radio-active material occurs is a large one, and at different points different constituents of the lode predominate. Those materials which constitute the gangue of the lodes are quartz, hæmatite, a rhombohedral carbonate of the calcite group, fluorite, barite, psilomelane, and fragments of the country rocks cemented into the lode-matter which has been introduced from below.

The primary radio-active minerals which have hitherto been recognised are fergusonite and monazite. Secondary ores, however, are more numerous, the presence of torbernite, autunite, uranophane, gummite, uranium ochre, and carnotite having been determined. Of this list torbernite and autunite are the most widely distributed and carry the uranium contents of the majority of the lodes which have been prospected. Torbernite is more abundant than autunite.

The structure of the lodes is more difficult to decipher in the absence of extensive underground workings, for the outcrops are in many instances partly concealed beneath a cover of angular detritus. It appears certain that some of the lode formations cross the strike of the altered sedimentary rocks, which have in almost all cases an approximately E. and W. trend. In the case of other occurrences the lode-matter is disposed along the direction of strike of these sediments. Some of the lodes are composite, with portions extending both across and parallel to the strike of the rocks enclosing them.

Since the distribution of the valuable constituents of the lodes is not regular, the trend of the ore shoots is of more commercial importance than the course of the lodes. No general rules applicable to the shoots of ore can possibly be formulated on the basis of existing exposures, and in any future developmental operations it will be certainly advisable to follow the better grade ore as closely as possible. Neglect to do this has been partly responsible for the present cessation of mining work. The richest shoot of ore yet discovered in the district still remains practically unexplored.

The corundum deposits are quite distinct from the uranium lodes. They are found where the micaceous schists are intruded by numerous veins of pegmatite. The corundum is only visible in the more massive developments of mica schist, and was not observed by the writer in any of the very numerous small lenses

and beds of schist intercalated with the intrusive aplitic or pegmatitic rock. Corundum is not the sole product of the contact metamorphism produced by these intrusions, for the mica schist carries also tourmaline, spinel, and cordierite in such a manner that it is evident that chemical factors decide the mineral species developed by the metamorphic processes. The investigation of this problem with respect to the mica schists should prove as interesting to the petrologist as have the researches of Morozewicz on the genesis of the same minerals from molten magmas.

This association of the other minerals with the corundum, however, seriously detracts from the value of the deposit in which they occur together; and at some points the place of the corundum is entirely taken by spinel. The total amount of mica schist carrying corundum alone, and seen by the writer in all parts of the field, is not large, and the average grade of such deposits is low. The highest-grade corundum deposit visited is that worked by the Radium Extraction Company at Corundum Camp, and it is here that the objectionable admixture of corundum with other minerals exists. The difficulty of obtaining water supplies for concentration purposes will prove a serious obstacle in the way of the successful development of any of the corundum deposits.

The turquoise found in the area worked by the Mount Painter East Prospecting Syndicate at the E. end of the field occurs in veinlets that are, so far as they have yet been proved, too thin and too broken for use in jewellery. The turquoise is closely associated with torbernite in this part of the field, and its presence should be watched for in the other localities in which torbernite is found.

Monazite occurs as a constituent of the lodes which carry the uranium ores, and also in the mica schists intruded by the pegmatite. Tests that have been made upon this monazite indicate the presence of only a very low proportion of thoria—less than 1½ per cent.—in the mineral.

The proportion of thoria present determines the value of monazite, and unless the percentage is over 3 per cent. the thoria cannot be profitably extracted. The supply of monazite from the beach deposits of Brazil and from the United States is such that only deposits of good quality so situated as to admit of inexpensive development can at present command a market value. In the case of the occurrences *in situ* at Mount Painter it does not seem probable that these will prove capable of being turned to account; but search should be made to the E. at the debouchures of the streams draining this district upon the plains for alluvial deposits of monazite, and the mineral, if found, should be tested at a number of places for its thoria contents.

Apatite has been found in association with blue corundum in the mica schist in a boulder lying in the creek bed at Corundum Camp. There is no sign of apatite in the corundum workings immediately above this place, and a sample taken in the tunnel proved, on assay, to carry only 0·07 per cent. of phosphoric acid. The occurrence of the boulder carrying the apatite indicates the necessity of keeping in view the possibility of the discovery of similar material *in situ*.

Prospecting and Mining.

The prospecting of the district surrounding Mount Painter was begun many years ago, but nothing was done in the way of opening up the mineral deposits until the locality was found to carry radio-active material. In 1896 the corundum deposit at Corundum Camp, near Mount Pitts, was discovered by Mr. W. B. Greenwood. Mr. Greenwood, in 1910, found carnotite in some lode matter, and forwarded it to Adelaide for examination. This discovery led to the recognition of torbernite, and ultimately to the more detailed prospecting of the field.

Since the latter end of 1910 three companies have been formed, viz., the Radium Extraction Company of South Australia, Limited, the Mount Painter Radium Proprietary Co., Ltd., and the Mount Painter East Prospecting Syndicate. The first mentioned company has been able to carry out the most extensive prospecting

and mining operations, and holds at the present time 11 mineral leases within the area examined. Twenty-seven mineral claims have been pegged out by the other two companies.

The Radium Extraction Company's Workings.

The Radium Extraction Company has opened up the lode matter at a number of places, at the majority of which the proportion of uranium present is not large.

No. 1 workings show traces only of torbernite in somewhat cavernous lode matter consisting principally of hæmatite and fluorite. The cavernous character of the ore appears to be due to the removal of fluorite. Only a shallow pit has been excavated at this place, and the results are not encouraging.

No. 2 workings are on the N. slopes of Radium Ridge, 9 chains to the E. of No. 1 workings. At this place there is a branch lode extending in a N. direction from the E. and W. formation which outcrops on the crest of Radium Ridge. The lode stuff consists for the most part of hæmatite and quartz. Monazite is present throughout the massive ore, and fergusonite is sporadically distributed in the form of small grains in portions of the lode. The cavities formed by the weathering of the cap of the lode, and also the small vughs in the practically unweathered parts of the formation contain oxidised uranium minerals—gummite, uranophane, and uranium ochre. The average proportion of the radio-active minerals other than monazite present in the lode is small.

No. 3 workings are situated 2½ chains to the W. of No. 1 workings. An excavation has been made and a shaft sunk on a complex formation. Torbernite occurs in small quantities in a pegmatitic rock which is associated with cavernous lode-stuff rich in hæmatite and similar to that exposed in No. 1 workings. About 50 tons of low-grade material have been stacked at the surface.

No. 4 workings are located on a S. spur of Radium Ridge, and consist of a pit 5ft. deep and a drive for 12ft. in a N.E. direction. There are traces of torbernite showing in the joints which traverse the gneiss at this place.

No. 5 workings, near the summit of Mount Gee, consist of an excavation 5ft. deep in an outcrop of quartz and hæmatite. Torbernite occurs in the form of scales in the joint planes and drusy cavities. Specimens carrying appreciable proportions of torbernite have been obtained at this place, but the average grade of the deposit is very low.

No. 6 workings are much the most important in the district. They are situated on a ridge about half a mile to the S. of Mount Gee. A strong outcrop runs along the crest of the ridge with a meridional course for nearly 500ft., terminating abruptly at both ends. This outcrop consists for the most part of hæmatite, but quartz and quartzite are associated with the iron ore, and a little psilomelane is present. From the S. part of this main outcrop spurs of similar lode-stuff extend in a W. direction following the strike of the country rock. The outcrop of one of these spurs carries strong seams or veinlets of torbernite and autunite, and at this place a shaft has been sunk to a depth of 100ft. The lode carrying the rich seams dips to the S. and passes out of the shaft at about 50ft. Prospecting drives have been carried S. at the 50ft. and 100ft. levels to expose the continuation of the lode. These workings have intersected lode-matter of low grade. The shoot of rich ore appears to pitch in an E. direction towards the main meridional lode. The only work done in this direction has been the excavation of a "cuddy" in the E. side of the shaft. The high-grade ore which has been exported and sold was obtained from the upper part of the shaft and the cuddy. The second class ore resulting from the handpicking of the richer lode stuff, and the remainder of the ore which carries appreciable proportions of uranium minerals have been stacked at the surface. Experiments are now in progress with a view of ascertaining whether this second-class material can be profitably treated on the mine by leaching.

A tunnel was started in an E. direction to cut the lode at a depth of about 160ft. below the collar of the shaft, but work was suspended when 170ft. of driving had been done. If continued for about 135ft., a position below the shaft will be reached. The shoot of rich ore will be at a still greater distance to the E. of the present face of the tunnel.

The company has wisely concentrated its attention upon this lode, but has, nevertheless, suspended operations without proving the extent of the high-grade ore in either a horizontal or a vertical direction. The writer would strongly recommend that a drive be carried E. at the 50ft. level to locate the shoot of ore at that level, and that the work be extended in the shoot of ore. Such a method of procedure will afford the necessary basis upon which work at the 100ft. level may be planned. It seems reasonable to suppose that exploratory work in the ore shoot will be paid for from the ore to be recovered. The position of the adit is well chosen for still deeper workings, if the results to be obtained at higher levels justify the continuation of mining operations at a greater depth.

No. 7 workings comprise some shallow excavations upon ill-defined formations which lie a little more than a quarter of a mile to the W. of No. 6 shaft. A shaft 30ft. deep has been sunk on the principal formation which is exposed by a meridional trench along its outcrop for a distance of 42ft.

Ore carrying appreciable proportions of torbernite is visible in the trench and on the N. side of the shaft for a few feet below the bottom of the trench. The grade of the formation, however, rapidly diminishes towards the bottom of the shaft, where only sporadic scales of torbernite are to be seen. About 50 tons of picked ore from the shaft and trench are stacked at the surface. This material carries less than ½ per cent. of uranium trioxide, and its value depends upon the cost of treatment by leaching with sodium bi-carbonate and the recovery of the uranium contents from the solution.

No. 8 workings are situated 35 chains to the N.W. of No. 6 shaft, on an outcrop of gneiss which is traversed by quartz veinlets. Torbernite is present in the form of scales and small stellate aggregates occupying the joint planes. Some specimens of fair grade have been obtained, but the general average value of the material exposed is very low.

The Mount Painter Radium Proprietary Company has hitherto carried out only superficial prospecting operations in search of deposits of corundum and radio-active minerals.

Traces of torbernite have been found on the slopes of Mount Painter, and corundum deposits of low average grade have been located on the N.E. side of Mount Painter, and in the valley between that mountain and Mount Gee.

The Mount Painter East Prospecting Syndicate, operating in the district lying to the N.E. and E. of Mount Painter, has carried out extensive surface prospecting. Torbernite has been found to be sporadically distributed over a large area, though no deposits of payable grade have been located. A little work has been done upon the most promising outcrops with disappointing results. The presence of turquoise at two places has been recognised, but the seams discovered possess neither the thickness nor the continuity essential to a commercially valuable deposit of this mineral.

Conclusion.

It appears that at the time of the first discovery of the uranium-bearing material the high value which uranium ores command, and the great scientific interest which pertains to them, have to some extent misled those who became interested in the development of this district. The uranium-bearing minerals themselves, occurring in brightly-colored scales or veinlets within a sombre-tinted matrix, are apt to convey a false impression of the value of the ore. Hence, in the popular mind, there arose an unwarranted belief in the presence of an immense quantity of

high-grade ore, and the market value of the shares became unduly inflated. The natural reaction set in when systematic sampling was undertaken, and ultimately all work upon the properties was stopped.

As often happens on such occasions, a more promising discovery has shared the fate of those which are not so deserving of further attention, and the possibilities of further finds being made have been indefinitely postponed.

The nature of the topography and the partial concealment of the outcrops of both lodes and country rocks on the slopes of the detritus-clad hills have tended to restrict prospecting to the combs of ridges and spurs. The amount of labor spent in prospecting so large an area of rugged country cannot be considered to have been sufficient to exhaust the possibilities of the district, even within the limits of the leases held by the Radium Extraction Company, which has had the advantages of technical skill and capital at its command.

It has been indicated that at least one very promising find has been made, viz., the lode at No. 6 workings in the Radium Extraction Company's property, and that this locality should receive further attention. The ore won from this spot has been obtained from a portion only of the workings, and it has been proved to have a high intrinsic value. The scheme of prospecting which has been adopted has been bold rather than successful, and the writer would advise that the shoot of rich ore be closely followed and defined at a shallow level before deeper workings are projected. The shoot of ore appears to pitch in an E. direction from the top of the shaft, and some E. drives should be put in on the course of the shoot.

The high-grade ore at this place has not yet been removed, save from the shaft and from a small excavation on the E. side of the shaft. No attempt has yet been made to define its extent, and it is unwise to attempt to estimate its average value from the insignificant exposure in existing workings.

The writer would advise that in future measurements be taken to determine the proportion of saleable ore to the amount of lode material broken, and that samples be taken of the lode at regular intervals.

Handpicking of the ore would appear to be the only method of raising it to a high tenor. The experiments now being conducted for the extraction of uranium from the lower grade ore by leaching with sodium bicarbonate will have an important bearing upon the future working of this lode.

With regard to the other occurrences of uranium ores, no such positive recommendations in favor of further prospecting can be advanced. The No. 7 workings of the Radium Extraction Company's leases rank next in value of the lodes now known to exist, and at this place the developments at a depth of 30ft. have been disappointing. The same is true of the No. 5 workings of the Mount Painter East Prospecting Syndicate to the N.E. of Mount Painter. None of the lode-matter so far exposed on Mount Gee or on Radium Ridge appears to be of payable grade. The richest of these workings is that known as No. 3, but the average grade at this place is very low.

The area occupied by the known uranium-bearing lodes is not large, but from the geological features of the district it appears possible that this area may be extended by further prospecting.

It has already been shown that the known occurrences of radio-active materials in South Australia are associated at all the places in which they occur, widely distant though these are from one another, with a certain type of rock, and from this ascertained fact it is to be expected that other uranium-bearing minerals may be found at the places where the rocks of like age and character are found.

The few discoveries of turquoise which have been made are closely associated with the uranium ores at the E. end of the area examined. The quality of the turquoise which has been located is good, and it is possible that further discoveries may be made of stouter veinlets which may have commercial value.

As regards corundum, none of the occurrences visited by the writer appear to be sufficiently rich or extensive to justify further expenditure of labor and capital to open them up. The corundum is not evenly distributed, and in many cases a schist which is corundum-bearing at one point carries spinel or tourmaline instead of corundum only a few feet away. The crystals of corundum are, in the majority of instances, tabular in form, and the weathered surfaces of corundum-schist usually give the impression of the presence of a larger amount of corundum than is found on breaking the rock. It is doubtful whether any of the occurrences visited by me would produce an appreciable bulk of schist averaging 5 per cent. of corundum.

It is logical to expect that many occurrences of corundum will be found other than those seen by the writer during the present visit, for corundum may be formed where the mica schists are intruded by pegmatitic dykes, and such conditions probably exist far beyond the limits of the area examined.

Ore of high intrinsic value only can, under existing conditions, be sent away from Mount Painter. Total freight charges to a seaport cannot be reduced to a lower figure than about £5 per ton ; and terms so favorable as these can only be secured if a regular output and transport service can be maintained.

The writer would strongly recommend the resumption of mining operations at No. 6 workings in the Radium Extraction Company's leases upon the lines indicated ; and he would advise also the further general prospecting of the uranium-bearing area already defined and the surrounding country for radio-active minerals.—(14–12–12.)

REPORTS

BY

The Assistant Government Geologist (R. Lockhart Jack, B.E., F.G.S.)

THE SILVER DISCOVERY ON SECTION 5, MILTALIE.

The recent discovery was made in a belt of country worked many years before, and in a desultory manner up to a recent date, for copper and lead. In the belt are the Miltalie or Franklin Harbor Mine, the Morowie and Yalpoudnie Mines, and the Mount Miller. The three former were opened up on copper lodes and the latter upon a formation carrying veins and bunches of galena of great purity. Silver, however, does not appear to have been recognised in commercial quantities before the present discovery was made.

The country rock is a series of very ancient and extremely metamorphosed sediments which pass in places into gneiss. Mica schists, quartzites, marble, and dolomite predominate, and are intersected by pegmatitic dykes which are undoubtedly intimately associated with the mineralisation of the district.

Mr. Atkinson's discovery was made on the crest of a ridge, having a deep gully to the E., and is situated about 500yds. E.N.E. from the S.W. corner of section 5, hundred of Miltalie. This crest is 1,200ft. above sea level, and is 18 miles by road from the port of Cowell.

As has been the history of many discoveries of note, the find was made accidentally. Several years ago Mr. Atkinson was prospecting for copper on the site of the N. shaft, and, having occasion to require some tools which he had left there, returned. Noticing a copper-stained stone he picked it up and subsequently had it assayed at the School of Mines, and this led to the discovery of the silver ore.

On the 16th November, while looking at some copper lodes in the neighborhood with Mr. Atkinson, he showed me the spot where he obtained this specimen, and dug up several stones of rich ore. At this time the N. shaft, 40ft. N. 40° E. of the site of these specimens, was down 6ft. in calcareous material stained with copper carbonates. Of the rich ore no outcrop whatever was visible, the specimens being obtained from beneath several inches of loamy soil.

Under instructions from the Hon. the Minister of Mines I revisited the discovery on December 5th and was able to see a little more of the deposit, as the existing shaft had been deepened to 9ft. and the lode exposed where the rich specimens were found. Here an opening had been carried down to 8½ft., but the lode has been left standing to within 3ft. below the surface. As the ore standing was partially concealed by decomposed material the width at the bottom could not be ascertained. On the cap, where alone it was possible to measure and sample the lode, the width on the N. end of the shaft was 2ft. 9in., made up of—W., 12in. clayey copper-stained material; centre, 9in. of copper-stained carbonate gangue, and 12in. of extremely rich ore on the E. side. This E. portion of the lode contains cerussite and some carbonate gangue, while cerargyrite, embolite, azurite, and malachite are conspicuous features. The southern end of the shaft shows a somewhat lesser width of lode, but the rich ore persists.

The W. wall is a somewhat argillaceous decomposed limestone, with harder veins, while the E. wall is a quartz mica schist. A few yards to the N.W. is a pegmatite dyke striking N.N.E. and S.S.W., and beyond that again dolomite occurs.

Fifteen feet N.E. of the last described pit a costean about 25ft. long has been put in, varying in depth from 3ft. to 8ft., the lesser depth being on the quartz mica schist of the E. wall. To the W. of this quartz mica schist 2ft. of formation carry copper stains. Silver was absent from the samples taken in this costean, but

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SITE OF SILVER DISCOVERY, SECTION No. 5, MILTALIE.

Mr. Atkinson informs me that stones of the rich ore were got in the loamy surface soil when the excavation was started. The remainder of the costean was in decomposed country.

The North or original shaft had been widened to 5ft. and shows decomposed limestone and calcite with stains of copper. It is probably a little to the W. of the line of the lode, as there was no sign of the quartz mica schist which lies to the east of the rich ore.

The following samples were taken by me and assayed by Mr. W. S. Chapman, of the School of Mines :—

S.W. working—

1. Three feet of decomposed material on the N.W. side of the lode assayed 29·8ozs. of silver per ton.
2. Two feet nine inches of lode, of which W. 12in. is clayey with copper stains, the centre 9in. copper-stained carbonate gangue, and the E. 12in. extremely rich silver ores, principally cerargyrite and embolite. This sample assayed 1,780ozs. of silver per ton.
3. Two feet of clay and quartz mica schist on the S.E. side of sample (2) assayed 5·6ozs. per ton.

From the costean 15ft. N.E. of above—

4. Three feet of decomposed material to W. of lode formation assayed nil.
5. Three feet of decomposed material, including 2ft. of formation carrying copper stains, yielded no silver.
6. Three feet of semi-decomposed quartz mica schist to E. of sample 5 assayed nil.

From the N.E. or original shaft—

7. S.W. end of shaft, over a width of 5ft. of decomposed limestone and calcite with stains of copper, assayed 1oz. of silver per ton.

These samples indicate that the values are practically confined to a width of 3ft. in the S. working, samples 1 and 3 being possibly contaminated from the rich ore adjoining them. The N. pit and the costean do not show values, though there is little doubt that in the costean the lode formation has been cut immediately to the W. of the quartz mica schist. It may be that the values have been leached out locally and that the material removed may be redeposited elsewhere.

As about a ton of the very rich ore obtained from the upper couple of feet of the lode over the length of the shaft was lying on the surface, a grab sample was taken from various portions of the heap.

This sample assayed 2,005ozs. to the ton, but can only be regarded as an approximation, the large size of many of the lumps and the occurrence of rich specimens of silver ore precluding accurate results from such a method of sampling.

Gold was absent from all the samples, and Mr. Chapman records the presence of cerussite, cerargyrite, embolite, malachite, and azurite in the highly argentiferous samples. Small crystals of native silver have been found in cavities in the ore.

Little can be said as to the future of the mine. The E. foot of ore exposed is phenomenal in its richness, and while this type of ore cannot be expected to continue downwards indefinitely, there is no reason to believe that the silver contents of the lode will disappear in depth.

The deeply dissected gullies in a region of low rainfall will probably be found to have lowered the water-level to a considerable depth, and from the nature of the gangue material rearrangement of the constituents of the lode will have gone on to water-level. The most essential work is to sink a prospecting shaft on the rich deposit. This, with a little driving, would give sufficient data to determine the advisability of driving an adit crosscut from the gully to the E. The steep fall into this gully lends itself to development by adits for about 200ft. below the crest of the ridge.

The discovery opens up possibilities beyond the immediate locality. The metamorphic Precambrian sediments intersected by pegmatites are common to the ranges N. of Cleve and W. of Cowell. When the intimate association of the pegmatites with the copper and lead deposits of the district, and with this silver lode, and the absence of any outcrop in the latter case are considered, the conclusion can only be that these ranges afford a field for prospecting worthy of attention. (10–12–12.)

In the course of the geological examination of the county of Jervois, undertaken with special reference to underground water supplies, the metalliferous metamorphic rocks were found to cover a large extent of country, and the opportunity was taken to inspect any workings seen along the route followed.

Tumby Bay Copper Mine.

Starting from Tumby Bay, the Tumby Bay Copper Mine, about 4 miles from the port, was the first property seen.

Two main lines of lode, about half a mile apart, have been worked. The S., or Tumby Lode, is reported to be about 15in. wide, and has been operated upon for a length of nearly a quarter of a mile and to a maximum depth of 107ft., wholly in the oxidised zone. The lode dips steeply to the S. and consists of quartz gangue with oxide and carbonate copper ores, malachite and azurite being the most conspicuous.

The Flinders Lode.

Half a mile to the N., dips S. 10° W., and has been worked to 200ft. (see Record of Mines No. 8). Between these lodes three other lodes, two of which have been worked, are visible, with dips varying from vertical to 70° S.

The country rock lying between the two main lines of lode is a greenish, generally fine-grained compact rock, with somewhat rounded phenocrysts of felspar. It is notable in that it carries a small fraction of a per cent. of chalcopyrite. A certain amount of chloritisation and schistosity is visible, the foliations being in a general E. and W. direction. While the lodes in the mass of this igneous dyke seem to occur in the more schistose portions, it is exceedingly probable that the Tumby and Flinders lodes are on the opposite margins of the igneous mass, and that their channels will be found to have a considerable vertical and lateral extension.

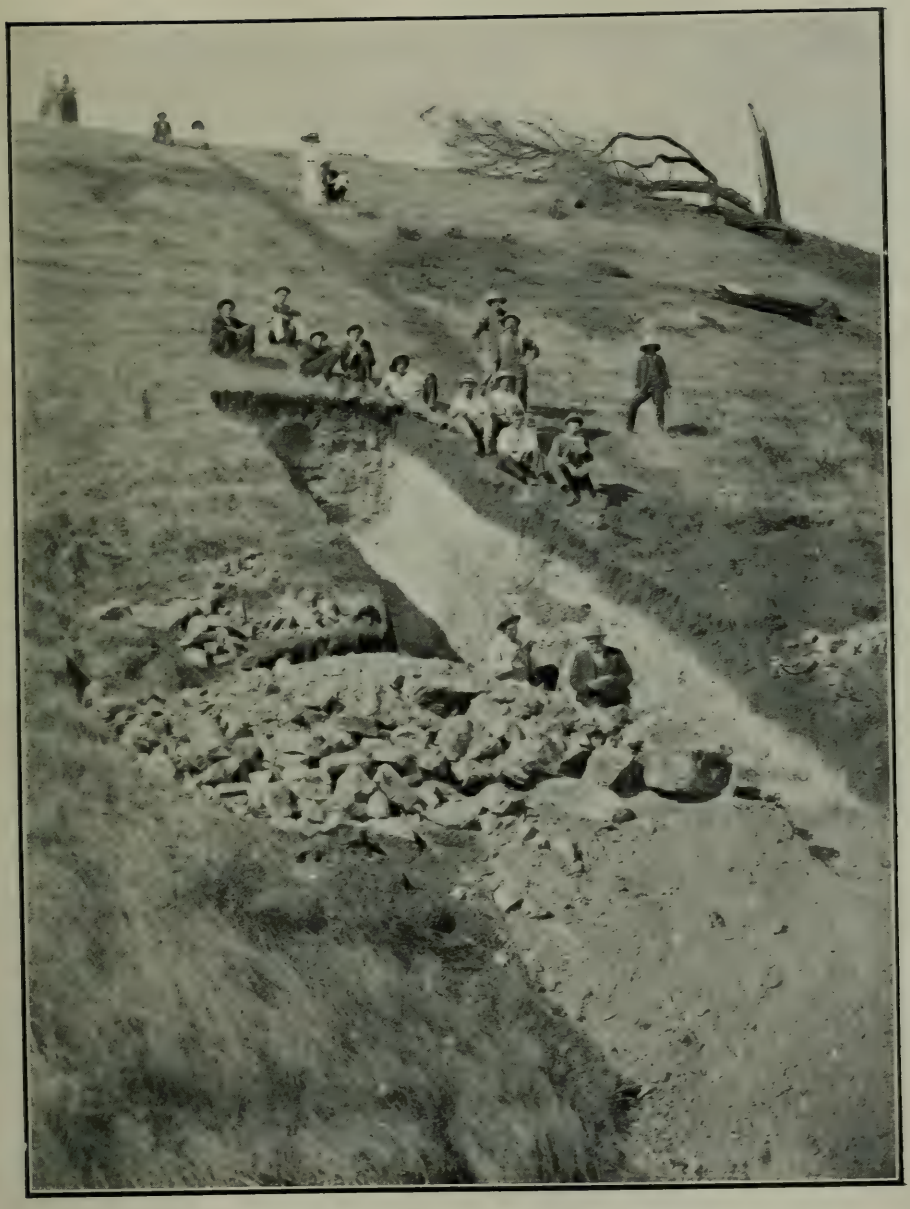
A vertical prospecting shaft was being sunk 18 chains to the N. of the Tumby lode in this dyke rock, but as there is no sign of a lode on the surface in the immediate vicinity, any discovery that may be made here would be purely fortuitous. In view of the prevailing E. and W. strikes of the known lode formations and their high angles of dip, a greater extent of country could be prospected for a given sum by crosscutting N. and S. than by continuing to sink.

Sections 94 and 95, Hundred of Yadnarie.

A Cleve syndicate is at work on these sections prospecting some copper-bearing formations.

There are three main openings on their claims, the most E. being that known as "Old Copper Mine" in section 94 of the hundred of Yadnarie. This is an underlie shaft sunk 30ft. on a dip of 50° N. The lode is up to 4ft. thick, and consists of quartz. Solid near the surface, the quartz from the bottom is more cavernous, and a little chalcopyrite and iron stains can be seen in it. Some good ore is stated to have been won from the outcrop a little to the W. of the shaft, and stones containing green and blue carbonates and a little oxide were visible on the dump of the shaft. The lode cuts through the schist, which here strikes N.W. to S.E.

No. 1 workings.—A quarter of a mile to the N.N.W. a shaft 28ft. deep, which could not be descended, and a costean have been put in by the syndicate now testing the property. A short crosscut has been driven to the S., and is stated to have exposed leaders of ore dipping steeply to the S.S.W. A soft, partly decomposed



SILVER DISCOVERY, MILTALIE—WORKINGS ON HILLSIDE.

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Half a mile to the S. is situated the Morowie Shaft. This is understood to have been sunk at least 40 years ago to a depth of 120ft., but has now fallen in. It was sunk on a pegmatite dyke varying from 1ft. to 8ft. in width and running E. and W. across mica schists, which dip 80° E.S.E. The pegmatite dyke shows stains of copper carbonate, but the dump proves the copper was not confined to the dyke, but occurred also in the mica schist.

Near the S. boundary of section 20 a trench has been opened along a formation of two parallel bands of altered rock, probably aplitic, with a horse of schist between them, and contained within schist walls. The copper minerals occur in the altered rock, which dips 80° E.S.E.

Half a mile to the W., in section 21, 3ft. of lode material dipping 30° N.W. by W. has been exposed in a shaft 6ft. deep. The ore resembles that seen in the vertical and underlie shaft to the N.E. Three-quarters of a mile to the S.S.W. is Atkinson's silver discovery, which has already been described (10–12–12) by the writer.

Other copper lodes are known to occur in the Precambrian area, but were not visited.

Other Minerals.

Lead has long been known to exist in the region.

The Mount Millar Mine is in section 158, hundred of Hawker. The country rock is mica schist with felspathic segregations. The lode formation appears to be a crushed gneissic zone striking N.E. to S.W., but the cap of the lode is ill defined.

The chief work done upon it was an old shaft about 30ft. deep underlying 75° N.W. The formation exposed in the shaft is about 8ft. wide, with a well-defined hanging-wall. Galena occurs through the formation in the form of veins up to 3in. in thickness, and in bunches. The shaft was being stripped and cleaned out at the time of inspecting, and about 2 tons of high-grade ore had been recovered and were lying at the surface.

The lode has been exposed in a costean 80yds. S.W. of the shaft, and galena is visible in two places in the costean about 15ft. apart. What is believed to be the extension of the lode formation has been traced to a gully some distance to the S.W.

The occurrence of galena in small veins is on record in a quarry in a pegmatite dyke at Yeldulknie Weir. Thin veinlets of the same mineral have also been recorded in section 1, Mangalo.

Torbernite was observed by the Government Geologist as thin scales in the quarry that yielded the galena at Yeldulknie.

Of extreme geological and practical significance is the association with and obvious relationship of all the lodes seen, whether copper, lead, or silver, to the intrusive pegmatitic and aplitic rocks. Some are actual ore bodies, and there is no doubt that the intrusion of the dykes had an intimate genetic connection with the process of mineralisation of the country. They are widely distributed, and prospecting in their vicinity may result in the further discovery of ore bodies; but the superficial covering of rock debris, sand, and soil will render the work of prospecting a difficult one, as many of the prospects that were seen showed little or no evidence of their presence on the surface.

Graphite and the ores of iron are also found in the district. The former is, so far as known, not very high grade, but should suffice for foundry and similar purposes if the price justified the cost of mining and carriage.

Gold is sparingly distributed in ironstone veins, according to information supplied by various people, but the writer could not hear of any having been won.

As a whole the prospects for the discovery of useful minerals in the hills W. of Cowell and N. of Cleve are promising. The region was run over at an early date in the history of the West Coast by prospectors who labored under many disadvantages, and not a great deal has been done since, despite the facilities afforded by settlement and the establishment of roads and better water supplies.

With the exception of the Miltalie, or Franklin Harbour Mine, it is believed that no shaft has reached water-level in the county of Jervois.

REPORT

BY

The Chief Inspector of Mines (W. H. Matthews, M.I.M.M.)

As instructed, I visited the supposed new gold find, situated on the S. portion of the Flinders Range, 15 miles in an E. direction from Port Pirie.

The workings consist of a large freestone quarry, from which, at the time of my visit, stone was being raised for building purposes. At various places in the cleavage of the rock there are small seams of siliceous matter which is usual in formations of this character. From one of these I was informed three small specks of gold were discovered. I made a very careful examination, but could not detect any gold, and samples taken from the siliceous seams in question failed to disclose the presence of that or any other metal.

In the vicinity there are several gossany ironstone deposits which had previously been worked for flux by the Broken Hill Proprietary Company to supply their smelting operations. Several samples were taken of these, but the results were of no particular value.

Possibly if prospecting is continued in other parts of the range better results might be obtained, but in this particular instance there was no justification for the reports whatever. (13–8–12.)

Reports by the Inspector of Mines (Mr. Henry Jones).

New Mount Grainger and Medora Gold Mine (*vide* Record, p. 250, and Reviews Nos. 8, 9, 13-16).—A large amount of good developmental work has been done at different points on the property, in course of which wide lode formations containing gold were disclosed, and a large amount of money has been expended in the erection of the necessary machinery and cyanide plant, and everything appears in good order for carrying on mining operations on a fairly large scale.

The principal workings consist of three underlie shafts sunk in the lode formation to depths of from 75ft. to 150ft., and three vertical shafts sunk to depths of 120ft., 200ft., and 335ft. respectively.

The main hauling shaft, and the deepest at present, is 12ft. by 4ft. 6in. in the clear, close timbered with jarrah, and divided with closed centres into three compartments —one for ladder way and two for hauling purposes. The shaft is substantially constructed, with every facility for speedy hauling and handling of large quantities of lode material from the underground workings at various levels.

At the time of my visit the lower workings at the 330ft. level were full of water and could not be examined, but the manager informed me that the main W. crosscut from the plat had been extended a total distance of 80ft. The main lode was intersected at a point 50ft. in the crosscut and proved to be 30ft. wide; the first 10ft. were sampled, and on assay gave values of 8dwts. 4grs. of gold per ton.

At the 220ft. level the S.W. drive has been carried in a total distance of 53ft. in the footwall portion of the lode, and the N.E. drive opposite has been extended a total distance of 81ft. In the face of the drive a start has been made to put up a rise to connect with the 120ft. workings. The portion of the formation disclosed in the drives and rise consists chiefly of sandstone, quartz veins, and boulders of quartzite, with small veins of ironstone traversing the formation in various directions. Some are parallel and others crossing the formation, and it appears that the greater portion of the gold contained in the formation occurs in the ironstone veins, in which gold can be frequently seen.

At the 120ft. level a large plat has been made and the crosscut from this is in a total distance of 76ft. The main lode formation was intersected and proved to be 29ft. wide, and a drive N.E. in the formation has been driven 136ft., at which point it connects with the underlie shaft, sunk on a shoot of ore from the surface. Over the back of the drive for a length of about 40ft. a fair amount of stoping has been done, and from the stope and the underlie shaft 520 tons of ore were extracted and treated, which gave a return of 219ozs. 19dwts. 6grs. of smelted gold. The formation disclosed in these workings consists of decomposed sandstone, quartz and ironstone veins, with boulders of quartzite for a width of from 25ft. to 28ft. between two defined slate walls.

Medora Workings.—Situated 600ft. S. from the Grainger main workings on the same line of lode.

A vertical shaft has been sunk to a depth of 200ft. At the 114ft. level a crosscut has been extended E. through the lode, which proved to be 28ft. wide. From the crosscut a rise has been put up and holed through to the underlie shaft, sunk on a shoot of ore from the surface. Two hundred tons of ore extracted from the underlie and the various other workings were treated, yielding 182ozs. 6dwts. 23grs. of smelted gold.

Jones's Workings.—E. lode. A vertical shaft has been sunk to a depth of 120ft. At the bottom of the shaft the drive S. is in a total distance of 25ft., and the N.E. drive 60ft ; the drive S.W. is in a total distance of 120ft. It appears that this drive is not quite far enough in to intersect the shoot of ore operated on in the higher levels. At the 66ft. level the vertical shaft and underlie are both connected, and a fair amount of stoping has been done at that level. The ore body disclosed consists of slate with small iron veins traversing it in various directions, which carry the largest portion of the gold ; 161 tons 11cwts. of ore have been treated from these workings at the Government Cyanide Works, Petersburg, yielding 458ozs. 17dwts. 14grs., worth £1,795 12s. 2d.

The gold-bearing material in both the E. and main lodes is of considerable width, and in bulk is of low grade, but with careful working and selecting out the barren material from the formation a large quantity of fair grade ore could be obtained.

Seventeen samples of lode material were taken from various parts of the workings on both lodes, which gave on assay an average of 7dwts. 23grs. of gold per ton.

The plant, and everything in connection with the working of the mine, is in good order, and now that an ample supply of water for both crushing and cyanide plants is available there are reasonable chances of making the large low-grade formation disclosed in the workings become remunerative.

Four hundred and twenty tons of battery tailings were recently treated by the cyanide plant on the mine and gave an extraction of 2½dwts. of gold per ton. (6–8–12.)

A large amount of good development work is being carried on at present on this property.

The extension of the N. drive on the course of the lode at the 220ft. level is in progress, and will be carried in to a point under the winze sunk from the 120ft. level, when a rise will be put up to connect the two workings. This will greatly improve the ventilation, and large blocks of ground on each side of the rise will be rendered available for stoping out.

Opposite the N. drive a start has been made to extend the S. drive towards the Medora shaft, with a view ultimately of connecting the two workings at the 220ft. level, so that the lode material from all the workings along the line can be hauled up the main shaft, which is close to the treatment plant.

At the 120ft. level over the N. drive stoping is in progress. The lode formation disclosed is from 18ft. to 25ft. wide, and is composed of ferruginous quartz, kaolin, and iron seams and bunches of ironstone running in various directions through the

formation, containing both coarse and fine gold. Hand samples of the ore taken from 24 trucks of lode material hauled to the surface were washed separately as the trucks came up, and each sample gave very nice prospects of gold in the dish.

The developments, so far, on this property are very encouraging; a lode formation of considerable width, containing a large quantity of fair average milling ore, is disclosed at the various levels, and the future prospects of this mine are very promising.

The 15-head stamp mill on the mine is at present running eight hours shift, but the manager is preparing everything ready to run the whole mill the 24 hours as soon as he gets the necessary repairs made to the main shaft below the 280ft. level. A new inclined tramline has recently been made from the level of the shaft to the foot of the hill, so that firewood can now be hauled up by the steam winch to a point convenient for the boilers at much less expense than previously. (9–12–12.)

Kitticoola Gold Mine (*vide* Record, page 70, and Reviews Nos. 8, 9, 13–16).—Since my last visit a large amount of development work has been done at the various levels and a considerable quantity of lode material has been extracted from the stopes above and below the 180ft. level.

Driving S. is in progress at the 180ft. level—the drive is in a total distance of 93ft. from the tunnel—the ore body over the back of the drive has been stoped out to the face for a height of from 30ft. to 40ft., with the exception of a few pillars left to support the hanging-wall. The lode material disclosed in these workings is from 4ft. to 6ft. wide.

From the highest point in the stope a rise has been started on an angle to the N., with a view of connecting with the rise put up from the N. part of the workings; it is now up 45ft. above the 120ft. level. The ore body in the rise is fully 4ft. wide, and is practically intact from there to the surface and for a length proved in the 180ft. workings of 600ft., but as there is no facility for getting down mullock to fill in the lower stopes it cannot be operated on until the rise has been completed through to the 60ft. level.

At the back of the 240ft. level N. of the underlie shaft a start has been made to stope out a block of ground proved at the 180ft. level for a length of 60ft. between No. 1 and No. 2 winzes, with every indication of it still continuing N. The gold-bearing material disclosed is from 3ft. to 6ft. wide, and consists chiefly of ferruginous quartz and iron.

For a length of 100ft. N. of the underlie shaft the ore body has been stoped out up to the 120ft. level, with the exception of some pillars left to support the ground.

From the 120ft. level a rise has been put up to the 60ft. level, and has been connected with an underlie from surface at that level. The rise, when completed to the surface on the present angle, can be utilised for a mullock pass to convey material from surface to fill in the stopes, which will greatly facilitate operations on the ore bodies in the N. part of the workings.

There are large quantities of lode material exposed at the various levels ready for stoping out. Over the N. portion of the N. drive at the 180ft. level, for a length of 120ft., the lode is intact from there to the surface, and under the drive is a block of ground 60ft. by 60ft.; these are available for stoping out. In all parts of the working the lode is fairly defined, varying in width from 3ft. to 6ft. and containing value from 3dwts. to 10dwts. of gold per ton.

Since October 23rd, 1911, 1,818 tons of ore have been extracted from the various workings and treated by the 10-head battery on the mine, yielding from battery treatment 379ozs. 15dwts. 4grs. of smelted gold and a few pennyweights of gold left in the tailings.

Nine samples taken of lode material from the various levels and workings were assayed at the School of Mines, and gave an average of 4dwts. 8grs. of gold per ton, and three samples of tailings gave an average of 2dwts. 16grs. of gold per ton.

There is a 10-head stamp mill working on the mine, driven by a suction gas engine and belt gearing, and everything appears in good working order; there are also five head additional on the mine ready for erection, and when that work has been done much larger quantities of lode material can be treated at comparatively little extra cost for milling. (13–8–12.)

TARCOOLA AND GLENLOTH GOLD FIELDS.

Preliminary Report.

Tarcoola.—Important prospecting work is in progress at both the E. and W. ends of the field; large ore bodies rich in gold have recently been discovered in the Day Dawn Mine in the E. end, and at the Perseverance and Morning Star Mines at the W. end.

The gold-bearing formations disclosed in the above-mentioned workings are all fairly defined and appear likely to extend for considerable distances, both N. and S. from the Tarcoola Hill.

The present developments are highly encouraging, and the recent discoveries are important, inasmuch as they prove beyond doubt that the field is an extensive one, with every indication that large lodes containing payable gold extend N. and S. into the unexplored ground on each side of the hill.

The Government battery on the field has been at work for the last two months crushing and treating lode material of fairly high grade from the various prospectors' claims; all the small parcels at the different claims, amounting to close on 300 tons, were treated during the above period. At the time of my visit the plant was operating on a parcel of 200 tons of second-grade ore from the Perseverance Mine. The lode material from this mine consists chiefly of soft kaolin, which makes the small quantity of water available for crushing purposes very thick and slimy, thus causing considerable delay in the crushing operations, owing to having to stop the plant for many hours at times to give the slimes a chance to settle and the water cleared for re-use.

Water for the battery is obtained at present from the W. well. A pump has been placed in the shaft, driven by an oil engine, pumping the water to a tank on the hill. From that point it runs by gravitation to the plant. The water making in this well is only about 900galls. per day, which is not sufficient to keep five head crushing regularly. There is another well at a distance of about 3,000ft. E. from the pant making about 1,000galls. per day; the pipes necessary to convey an additional supply of water from this well to the battery are now on the road to the field.

Glenloth Gold Field.—At the time of my visit only one party of prospectors was at work, and had about 36 tons of ore on the battery floor ready for treatment.

The Government plant on the field consists at present of a 5-head stamp mill and a small cyanide plant of 25 tons per week capacity.

The developments on this field up to date are very encouraging. A large amount of valuable prospecting work has been done at various points, proving the country to be highly auriferous for a distance of several miles in length. A great number of lodes varying in width from a few inches to 2ft. wide, containing rich gold, have been discovered in the district, and shafts have been sunk and the lodes operated on down as far as convenient with windlass power; but no doubt when the Western Railway has been constructed up to the field and better facilities are availaole to convey machinery to the properties mining will be carried down to a much greater depth, and probably many new discoveries will be made.

Earea Dam Field.—Tin and gold were discovered on this field many years ago. A fair amount of prospecting work has been done to shallow depths on some of the reefs and a fair amount of gold was obtained from the workings, and, doubtless, when railway facilities are available the reefs will be explored to much greater depths. At the time of my visit no one was working on the properties.

Mount Gunson Copper Mine.—Large quantities of plant and mining material have recently arrived on this property, and the work of erecting the experimental plant and necessary stores and other buildings is now in progress. A fine site has been selected for the main treatment plant on high ground above the old works. The new plant will occupy a large area of ground, and when the erection has been completed the property will be worked on a fairly extensive scale, employing a large number of hands.

The want of water for domestic purposes is likely to be of considerable trouble in this part, unless something is done to conserve the water in the rainy seasons for the use of the workmen; but the Government, I was informed, have already selected an excellent site for a large cement tank in the vicinity of the mining properties, and doubtless that will be constructed before the mines are at work full handed. (20–9–12.)

The Glenmarkie Gold Mine (*vide* Record, pages 313 and 314).—Situated on the Glenloth Gold Field, about 2 miles W. from the township.

A fair amount of work has been done at one time on the lode formation traversing this property; an underlie shaft has been sunk in the lode to a depth of 60ft., and at that level the drive N. has been carried in a distance of 58ft., the ore body over the drive stoped out up to the surface and a large quantity of payable ore extracted from the various workings. At the time of my visit the old underlie shaft had fallen in a short distance down from the surface, and there was no possible chance to get down to examine the lode at the lower level.

The principal work in progress at present on the block is the sinking of a new underlie shaft in the formation a short distance N. from the old workings, in which the ore body all the way down for the total depth sunk, 40ft., is well defined, bearing N. and S., dipping E. at an angle of 47°. The lode consists chiefly of ferruginous quartz and decomposed slate, 1ft. to 3ft. wide, carrying gold. Thirty-six tons of lode material obtained in sinking the shaft has been carted to the Government plant on the field and stacked on the battery floor ready for treatment.

A short distance E. from the underlie workings a good vertical shaft is down a total depth of 150ft., and from the bottom of the shaft a crosscut has been carried in for some distance W., but apparently not quite far enough to intersect the main lode. This crosscut is well worth extending a farther distance W. so as to test the ore body at this depth, and should it prove payable a large block of ground would be available for stoping out up to the 60ft. level, and with the better facility for hauling the material from the workings the mine could be opened out and worked on a fairly extensive scale.

Four samples taken from the workings gave on assay—

No. 1, from N. end of shaft, gave 12dwts. of gold per ton.
No. 2, from S. end of shaft, gave 5dwts. of gold per ton.
No. 3, from centre of shaft, gave trace of gold.
No. 4, from leaders 12ft. W. from lode, 1oz. 5dwts. of gold per ton.
(25–8–12.)

Morning Star Gold Mine.—Situated on the Tarcoola Goldfield; it is a new mine near the W. end of the field, two miles from the township, adjoining the Perseverance on the W. side, and on the S. the N. boundary of the Tarcoola Blocks leases.

Prospecting work was commenced by Hisgrove and Schrader on this block some few months ago, and, after properly locating the reef traversing the property, a fair amount of good developmental work has been done.

At a point on the brow of the hill, near the S. end of the lease, a trial shaft in the reef was started and has been sunk to a depth of 25ft., at which level a well-defined slate break was intersected, which cut off the reef, and, judging by the indications on the line of displacement, the lower portion of the reef under the break should be found a short distance W. from the bottom of the shaft. Breaks of similar nature to the one disclosed in these workings appear to occur in all the reefs traversing the various slate beds on this field, and in the vicinity of the displacement the reefs are invariably fairly rich in gold.

In the present shaft from a depth of about 12ft. exceedingly rich stone was obtained in the reef, which appears to be a shoot dipping S. in conformity with the angle of the slate break.

From the bottom of the shaft work in the reef has been carried in S. for a distance of 20ft. The ore body disclosed in the workings is fairly defined, bearing N. 20° E., and consists chiefly of ferruginous quartz and decomposed slate, from 1ft. to 3ft. wide. The formation is strong, with two good walls, and it appears quite likely to continue N. for a considerable distance, and also S. into the Tarcoola Blocks leases.

To further develop and work this promising lode a proper site should be selected for a main working shaft a short distance S. from the present workings to intersect the main shoot of ore at a reasonable depth, and then crosscut W. to intersect the lower portion of the reef under the break in the slate bed, where probably it will be found to be fairly rich.

From the present workings 33 tons of fairly high-grade ore have been extracted and recently treated at the Government plant on the field, yielding a return of 7ozs. 2dwts. 8grs. of gold per ton.

In most of the lodes on this field, so far as they have been operated on in the various mines, it appears that the gold occurs in rich shoots and pockets, the lode material between being generally of low grade, as shown by the four samples of lode material taken from the present workings—

No. 1, taken from just below the shoot of rich ore, gave a trace of gold.

No. 2, taken from just above the shoot of rich ore, gave 5dwts. gold per ton.

No. 3, taken from just above S. end shoot of rich ore, gave 4¼dwts. gold per ton.

No. 4, taken from N. end, gave 3dwts. gold per ton.

(26–8–12.)

The Tarcoola Perseverance Gold Mine (*vide* Reviews Nos. 14, 15, and 16) —Situated near the W. end of the Tarcoola Goldfield, about two miles W. from the township.

The property adjoins the N. boundary of the Tarcoola Blocks leases, and a large amount of good development work has been done at various points by shaft-sinking and driving at different levels. A well-defined lode formation is disclosed in the workings for a total length of 150ft., bearing N. 10° E., going down nearly vertically, and consists chiefly of quartz, quartzite, and white kaolin, from 2ft. to 6ft. wide, containing rich gold.

No. 1 shaft has been sunk in the lode to a depth of 70ft., and from the bottom a drive has been extended N. in the lode for a distance of 33ft., and the drive S. opposite for a distance of 40ft.; the ore body over the drives has been stoped out up to the 40ft. level, the lode formation disclosed in both drives being jointed and broken quartz of various sizes bedded in soft white koalin for a width of 3ft. to 4ft.

At the 40ft. level a drive has been made S. in the lode for a distance of 60ft. from the shaft, and the drive N. opposite the latter has been extended 90ft., and connected with No. 2 shaft, sunk from the surface to the 40ft. level. A fair amount of stoping has been done over the S. drive, and also a considerable amount over the N. drive, and carried up in some parts to within a few feet of the surface. The ore body disclosed consists mainly of quartz and quartzite and white soft kaolin, 3ft. to 4ft. wide, containing rich gold.

From the various workings of No. 1 and 2 shafts down to the 70ft. level 516 tons 10cwts. of ore have been extracted and treated at the Government crushing and cyanide plant on the field, giving a return of 1,359ozs. 1dwt. of gold of a total value of £6,111 19s. 11d. At the time of my visit to the field a parcel of about 200 tons of second-class ore was being stacked at the mine and a start made to cart it to the battery for treatment.

No. 3 shaft, situated about 3 chains S. from the main workings, has been sunk in lode formation to a depth of 40ft.; the lode material disclosed in the shaft consists chiefly of quartz and kaolin, carrying gold, and in sinking the shaft four patches of fairly good stone were obtained at different levels. The hanging-wall of the formation is well defined, having a slight angle to the E., but no footwall is showing; the lode material in the bottom of the shaft at the present level is of low grade, averaging 1dwt. of gold per ton.

A short distance W. from No. 3 shaft the outcrop of a quartz reef is showing on surface, and on it a hole has been sunk to a depth of 6ft. The reef disclosed is well defined, bearing N.W., and consists of solid quartz, 16in. wide, containing high values. A sample taken from the bottom of the hole and assayed gave 3ozs. 9dwts. of gold per ton. This reef, judging by its present trend, should junction with the main lode at a point a short distance S. of No. 3 shaft.

The developments so far on this property are very encouraging; the lode formation in the various workings is of fairly good width and well defined, and appears likely to continue both N. and S. and to a depth, and the shoot of rich ore in the vicinity of the main shaft is of fair length and appears to be going down at a slight angle to the S. In the faces of the various drives on the course of the lode N. and S. at the 40ft. and 70ft. levels the lode material is at these points of low grade, as shown by the various samples taken, but probably as the drives are being further extended other shoots of rich ore will be intersected.

Three samples lode material, face of drives 70ft., averaged 5dwts. gold per ton.
Two samples lode material, face of drives 40ft., trace.
Three samples lode material, kaolin and quartzite, 4dwts. gold per ton.
Two samples lode material, No. 3 shaft, 1dwt. gold per ton.
One sample lode material, quartz reef, 3ozs. 9dwts. gold per ton.
One sample lode material, rich ore dump, kaolin and quartz, 1oz. 10dwts. gold per ton.

The discovery of this promising formation containing rich gold at this point in the field shows that the numerous formations traversing the auriferous belt of country N. of the Tarcoola Hill are all well worth being systematically prospected along the lines of strike and to a depth.

The prospects of this new mine are highly promising and warrant it being opened out and worked on a larger scale, and when equipped with the necessary winding and treatment plants it will have a reasonable chance to become a profitable mining concern. (26–8–12.)

The Tarcoola Blocks Gold Mine (*vide* Record, page 286, and Review No. 9).—The main vertical shaft on the property is down a total depth of 330ft., and from different levels a considerable amount of crosscutting work has been done to intersect the various gold-bearing reefs in the vicinity.

Above water-level (the only part of the mine that could be examined at the time of my visit) about seven gold-bearing lodes are disclosed, varying from 1ft. to 4ft. A fair amount of driving has been done along the courses of the various lodes, and ore stoped over the backs of the drives for considerable lengths and, at some points, up to the surface.

The lode formations as shown in the workings are fairly defined, bearing N. and S. and going down nearly vertically. Small breaks have occurred in the various lodes at different points along the lines of strike near the junction of the slates and quartzite belts, and in the vicinity of these breaks the lodes have proved to contain exceedingly rich stone, which occurs in shoots dipping S. at an angle of from 45° to 50°, conformable to the dip of the slate breaks.

A fair amount of work has been done in several of the lodes traversing the property, and from the various workings about 31,000 tons of ore have been extracted and treated by the plant on the mine, yielding 43,585ozs. of gold bullion of a total value of £131,665.

The mine has been working continuously for over 10 years, employing a large number of men, but at present work below in the main shaft has been temporarily suspended.

Since the operations in the main workings ceased parties of tributers have been working in three of the reefs traversing the E. part of the property.

Robins and party have done a fair amount of work near the surface, over the tunnel in "McKechnie's Reef." The lode material disclosed consists of ferruginous quartz, 1ft. to 3ft. wide, carrying gold; 9 tons 10cwts. of ore extracted from this shallow working were recently treated at the Government battery and gave a return of 11dwts. 16grs. of gold per ton.

In Minnis's reef, near the mouth of the tunnel, at a depth of 15ft. below the surface, a fair amount of underhand stoping has been done by Watkins and party. The lode consists chiefly of quartz from 2ft. to 3ft. wide; 28 tons 15cwts. of ore were obtained from the stope, which was treated at the Government battery, and gave a return of 1oz. 19dwts. 15grs. gold per ton.

Stoping is in progress by Giles and party at the 50ft. level in Dedman's reef. The ore body disclosed is fairly defined and consists of ferruginous quartz, 15in. to 24in. wide, carrying gold; 45 tons of ore recently obtained from these workings were treated at the Government battery, yielding 10dwts. 10grs. of gold per ton.

A large number of highly promising lode formations traverse this property containing high-grade ore, as shown by the amount of gold obtained from the large quantity of lode material treated by the mine battery. Judging from what can be seen in the upper levels and workings, and the dip of the rich shoots of ore operated on, there are strong indications that the continuation down of the same ore bodies should be intersected S. of the main shaft at the bottom level, and the prospects of the various lodes disclosed in the mine containing rich shoots of ore along the line of strike N. of the point hitherto operated on are very encouraging, as shown by the important developments in the large lode formations recently discovered in the adjoining mines near the N. boundary of this property.

The future prospects of this mine are very promising, and when more reliable and less costly means of conveying mining requisites from Port Augusta to the mines are available, the carrying on of mining operations on the properties will be greatly facilitated, and this mine, as well as others on the field, will have much better chances then to become payable mining ventures than they have at present. (27–8–12.)

The Day Dawn Gold Mine, formerly Warrigal East (*vide* Record, pages 304 and 306).—Situated on the S. side of the Tarcoola Hill, three-quarters of a mile S.W. from the township.

The Warrigal East Company did a fair amount of prospecting on this property, but apparently no lodes containing sufficient values were discovered at that time, and the leases were abandoned.

Recently Mr. W. Hays and party took up the ground, and since they commenced to work two gold-bearing formations have been discovered traversing the leases, bearing N.W. and going down at a slight angle to the S.W.

In the Day Dawn lode two shafts have been sunk to depths of 25ft. and 40ft. respectively. From the bottom of No. 1 shaft at the 25ft. level a drive S.E. on the course of the lode has been extended for a total length of 93ft., at a point 39ft. in; the drive and No. 2 shaft have been connected; the drive N.W. on the course of the lode at the same level has been extended a total length of 27ft. Over the drive for a height of 15ft. and for a length of about 50ft. the ore has been stoped out. The gold-bearing material consists of quartz and white kaolin of loose and soft nature, 2ft. to 3ft. wide, enclosed in quartzite and sandstone country rocks.

About 180ft. N.E. from the Day Dawn formation a fair amount of work has been done in Hays' lode, which, in the present limited workings, appears to be running parallel with the latter, but dipping at a slight angle in the opposite direction to the Day Dawn lode. A shaft has been sunk in it to a depth of 50ft., and from the bottom a drive has been carried in S.E. on the course of the lode for a distance of 10ft., and a drive N.W. 30ft.; the lode formation disclosed consists of loose quartz and white kaolin, 3ft. to 5ft. wide. At the 30ft. level a drive has been extended N.W. in the lode for a distance of 31ft., the formation is from 5ft. to 6ft. wide, and of similar nature to that in the other workings.

From the shafts and other workings done in the two formations, 256 tons 5cwts. of ore have been obtained, which, on treatment at the Government crushing and cyanide plant, gave a return of 150ozs. 5dwts. 9grs. of gold bullion, valued at £398 19s. 3d.

Three chains N. from Hays' workings a shaft has been sunk to a depth of 12ft.; a fairly defined quartz lode 2ft. 6in. wide is disclosed in the bottom, but at the present depth it does not appear to contain much value. A sample of the ore on assay gave 1dwt. of gold per ton. The lode is strong and likely to continue down and appears well worth testing to a greater depth down in the slate belts of country, where there is a reasonable chance of the lode containing high values.

About 5 chains N.W. from the main workings two shafts, 100ft. apart, have been sunk to a depth of 30ft. each, and from the bottom of the W. shaft a crosscut has been extended W. 28ft., in which is disclosed a ferruginous lode 12in. to 18in. wide, carrying gold. A sample of the lode material assayed 10dwts. of gold per ton.

In the workings in the Day Dawn lode a fairly good shoot of ore is disclosed in the vicinity of No. 2 shaft, but it has gone underfoot in the S.W. drive, dipping slightly to the S. A sample taken of the lode material from the stope over the drive near No. 2 shaft gave 17dwts. of gold per ton. The lode formations in the face of the N.W. and S.E. drive at present level are of low grade. Five samples taken of lode material from both drives gave an average of 1½dwts. of gold per ton.

In the workings on Hays' lode at the present level—as shown by several samples taken—the ore body in bulk is of fairly low grade, but doubtless by carefully selecting out the kaolin and other poor material a better class of ore would be obtained. Five samples taken of lode material from different parts of the working gave an average of 1dwt. of gold per ton.

The two main lode formations operated on at present are of fairly good width, soft and easily worked, and the prospects so far, as shown by the amount of gold obtained from the ore treated, are very encouraging, and fully warrant deeper sinking and the lode being more extensively explored along the line of strike at greater depth. (28–8–12.)

Mount Lyell Consols Wallaroo Copper Mine (Bingo) (*vide* Record, p. 29, and Reviews Nos. 15 and 16).—Situated near Kadina.

In the main shaft, at the 250ft. level, the S. crosscut has been extended through a large lode formation containing high-grade copper ore.

The ore body disclosed consists mainly of quartz and specks of calcite, all densely impregnated with nice seams of sulphide ore and small patches of iron pyrites. The seams of ore vary in thickness from 1in. to 12in. The country on each side of the quartz lode is highly mineralised and appears to be part of the formation.

The development, so far, in this mine at the 250ft. level is very encouraging, and the lode already intersected is fairly defined and appears likely to contain large quantities of high-grade sulphide ore. (30–9–12.)

The Robertstown-Bright Silver-Lead Mine.—Situated in the hundred of Bright, about 7 miles from Robertstown.

On the W. claim several prospecting holes have been sunk to a depth of from 3ft. to 6ft., disclosing ore-bearing material for a width of from 4ft. to 7ft. wide, which can be traced on the surface for a considerable distance, bearing N.W. The material disclosed in these shallow workings consists chiefly of dolomite containing small seams and specks of galena, and in the trial pits and along the outcrop the prospects are very encouraging and warrant the formation being tested at a greater depth.

On the two middle claims three prospecting shafts have been sunk to a depth of 13ft., 14ft., and 16ft. respectively. In the main shaft, and the deepest one at present, the lode formation is fairly defined, bearing N. 10° W. and going down with a slight underlie to the W. The lode formation disclosed in the shaft consists of dolomite and decomposed slate 4ft. wide, with a vein of sulphide ore on each wall 4in. to 6in. wide, chiefly galena, and cerussite.

The other two shafts, sunk to depths of 13ft. and 14ft., are about 4 chains apart, and appear to have been sunk on a lode formation running parallel to the one in the main shaft. The ore-bearing material disclosed in both shafts is fairly defined, and consists of dolomite 3ft. to 4ft. wide, containing small seams and bunches of galena.

About 6 chains W. from the main shaft, on the brow of the hill, a shallow prospecting pit has been sunk to a depth of from 2ft. to 3ft. showing fair size boulders of dolomite containing rich patches of galena, and also nodules of solid galena have been obtained near the surface. There does not appear to be any lode formation discovered at this point, but the indications are very promising that a rich lode is likely to be found in the vicinity. This part of the property is well worth being further prospected by surface trenches, with a fair chance of discovering a good lode.

Considering that up to date only a limited amount of prospecting work has been done on the property, the future prospects are encouraging, and fully warrant the three lode formations traversing the blocks being further tested and developed to a greater depth. And, as shown by the various samples taken from the different parts of the property, the ore-bearing material extends over a considerable area, and the lodes contain fair values near the surface, with every chance of improving as greater depth is attained.

In all 24 samples of lode material were taken from the various shallow workings and were assayed at the School of Mines—

		Silver.		Lead.
No. 1	sample, from formation traversing W. block	8dwts.	..	2·1%
2	" " " "	6 "	..	trace
3	" No. 2 formation traversing middle blocks	6 "	..	trace
4	" " " "	8 "	..	1·0%
5	" " " "	4 "	..	trace
6	" " " "	2 "	..	trace
7	" formation middle blocks	2 "	..	1·5%
8	" " " picked stone	10 "	..	5·2 "
9	" " " vein 3in.	6 "	..	8·0 "
10	" " " "	14 "	..	31·6 "
11	" " " picked ore	18 "	..	42·2 "
12	" " near main shaft	14 "	..	31·0 "
13	" " main shaft, vein 4in.	16 "	..	13·5 "
14	" " " "	14 "	..	18·7 "
15	" " bulk for 4ft.	12 "	..	7·2 "
16	" " picked ore	1oz. 4 "	..	38·0 "
17	" " main shaft dump, soft material ..	8 "	..	10·5 "
18	" " " hard material	6 "	..	2·0 "
19	" " N. of main shaft 2ft. deep	6 "	..	8·0 "
20	" " " 6ft. "	2 "	..	trace
21	" " " dump 6ft. deep .	4 "	..	trace
22	" " picked ore	1oz. 14 "	..	24·5%
23	" " top of hill, picked ore.....	1oz. 6 "	..	53·5 "
24	" " " hole 2ft. deep.....	12 "	..	1·0 "

(16–10–12.)

Kanmantoo Copper Mine (*vide* Record, page 66).—Situated about two miles from Kanmantoo township and three miles from Callington Railway Station.

Mining operations were commenced on this property in the year 1846, and work was carried on continuously for about seven years under unfavorable conditions, owing to the large expenses incurred in getting mining requisites to the mine and the carriage of the ore to market, and, as mining operations showed no profit, work ceased. Subsequently a large amount of mining work has been done by small local companies and tributers at different times on the various lodes traversing the property, and, judging by the old workings, some thousands of tons of lode material have been extracted.

There appear to be five copper ore bearing formations traversing the property, bearing N. and S., and one lode bearing E. and W. A large amount of work has been done in each lode by open-cut workings along the line of strike, and at various points shafts have been sunk on the lodes down to water-level, but as no work has been in progress in the various shafts for a number of years, most of them have fallen in and the lower workings could not be examined.

A few months ago work was resumed on the property by the present syndicate. Since commencing operations the vertical shaft in the vicinity of the Emily lode and Emily's whip shaft, both of which are connected at the 65ft. level by a crosscut 40ft. long, have been cleaned out and fixed up for bailing purposes.

The whip shaft sunk in Emily's lode is down a total depth of 120ft. (80ft. vertical and 40ft. on the underlie); the water that had accumulated in the shaft has just recently been bailed out and the workings are accessible for inspection. At the bottom of the vertical portion of the shaft and N. of the underlie a fair amount of stoping has been done for a length of 50ft. and for a width of from 10ft. to 20ft., with no defined walls showing.

The ore-bearing material disclosed in the stope and the bottom of the underlie appears to be of great width and consists mainly of schist and quartz, containing seams and bunches of high-grade sulphide ore, chiefly copper pyrites, with a little gold and silver. At the present level the lode formation appears very promising, and, as shown by the six samples taken of ore in the bottom and sides of the underlie shaft, it contains good values for a great width.

	Copper.	Silver.	Gold.
No. 1. Sample from bottom of shaft for 3ft. } total 6ft. { ..	8·0%	16dwts.	—
No. 2. " " " " 3ft. } total 6ft. { ..	4·1%	12dwts.	—
No. 3. " E. side of shaft	13·7%	1oz. 3dwts.	1dwt.
No. 4. " "	11·0%	16dwts.	5dwts.
No. 5. " W. "	10·5%	1oz. 6dwts.	—
No. 6. " "	7·3%	1oz. 3dwts.	1dwt.

At the 25ft. level, surface open workings, stoping, and driving are in progress on what appears to be a branch off Emily's lode. The ore body disclosed is fully 2ft. wide of schist, containing seams of carbonate of copper, chiefly malachite. A sample taken of the ore for the full width of the lode gave—9·9 per cent. copper and 12dwts. silver, and a sample taken from a dump of dressed ore on surface gave 32·2 per cent. copper, 3dwts. gold, and 3ozs. 5dwts. silver per ton.

The other lodes that traverse this property are Roper's, Quarry, Kangaroo, West Kanmantoo, and the E. and W. lode. A considerable amount of work has been done to shallow levels in all of these formations, and judging from the great extent of the old workings along the line of strike and the apparent width of the lode material stoped out, some thousands of tons of ore must have been extracted from the various lodes.

Seven picked samples of lode material were taken by me from the surface dumps, and gave on assay—

	Copper.	Silver.	Gold.
No. 1. Dump of ore on surface from Emily's lode.....	6·1%	18dwts.	—
No. 2. From dump W. from Emily's	6·5%	—	—
No. 3. West Kanmantoo lode	6·8%	—	—
No. 4. Picked from dump, Kangaroo	7·9%	—	4dwts.
No. 5. Quarry workings.....	12·0%	—	—
No. 6. Roper's workings	3·6%	—	—
No. 7. E. and W. lode dump	7·6%	2oz. 4dwts.	—

Judging from what can be seen in the present workings on Emily's lode, and along the surface workings of the other formations, the future prospects of the property are very encouraging and fully justify the expenditure of the necessary capital to further prove the lodes and develop the mine to a greater depth. (26–10–12.)

Bumbumbie Hill Gold Mine.—Situated about eight miles from Teetulpa Goldfield.

Two sets of reefs traverse this property, and at different points the outcrops are fairly prominent above the surface. Some of the reefs bear N. 28° W. and others cross them. They vary in width from a few inches up to 3ft. and consist chiefly of ferruginous quartz, carrying gold.

A fair amount of work appears to have been done at one time on one of the reefs. Three shafts have been sunk about 2 chains apart on the N.E. underlie of the lode to a depth, apparently, of from 15ft. to 25ft., but as the old workings had all fallen in there was no chance of examining the lode operated on in the shafts. In the

surface dumps near the shafts a fair amount of lode material was showing, which consists chiefly of ferruginous quartz, and some of it proved to contain fair value in gold, as shown by the four samples taken—

	Gold per Ton.
No. 1 from S.W. end of workings, hole 2ft. deep	nil
No. 2 dump, S.W. shaft	15dwts.
No. 3 dump, middle shaft	6dwts.
No. 4 dump, N.E. shaft	2ozs. 8dwts.

This property appears well worth being developed at greater depth. (7–11–12.)

The Wallaroo Mines.—The principal workings consist of three hauling shafts sunk about 170 fathoms apart. Each shaft is strongly timbered from surface to bottom and is divided into three compartments ; two are used for hauling purposes and one chamber, cased off for pumps and ladder ways, is equipped with permanent ladders placed in position at proper angles, with substantial platforms every 30ft. from surface to the bottom of the shafts.

The three shafts mentioned above are also equipped with most substantial head gears and powerful first-motion winding plants, with man skips and safety appliances attached.

The shafts are also connected by the 285 and 325 fathom drives, both of which are large and kept in first class order for the purposes of permanent travelling roads from one shaft to the other ; both drives are accessible from any part of the extensive underground workings by means of a number of ladder ways, and various passes from one level to the other, and should anything occur to prevent the working of one shaft at any time, the other two shafts are available for hauling the men employed underground to the surface.

In Taylor's shaft (which is the deepest part of the mine) at the 125, 205, 305, and 405 fathom levels there are four pumping stations. Three of the pumps are worked by electricity, and the one at the top level by compressed air ; the chambers for the pumps and water storage, at each level, are large and have been substantially timbered and whitewashed with lime, and large portions of the chambers are cased with thick asbestos to keep the wires from coming into contact with the wood. All parts of the chambers are kept scrupulously clean from oil or any inflammable material, thus minimising the chance of a fire, and should a fire occur the man in charge of the pumps has an ample supply of water close at hand to quench it at once.

With a view of preventing the occurence of fire in the extensive underground workings, where such large quantities of timber are used in securing the drives and stopes, a well-equipped water service has been installed throughout the mine, with taps and hose at various points along the drives and at the plats.

In addition to the above, a second line of pipes has been placed in the shafts, with branches and taps at each plat to convey fresh water to the various levels for drinking purposes.

In conclusion, I am pleased to state that everything in connection with the underground and surface workings on this property is kept in first-class working order, and everything tends to show that no expense is spared in carrying on the work in a proper manner, and with the greatest regard for the safety of the men employed. (28–11–12.)

Kirkeek Treasure Gold Mine (*vide* Record, page 226, and Reviews Nos. 8, 11, 13, 15, and 16).—Situated on the Nillinghoo Goldfield, three miles N.W. from Mount Victor, and about 25 miles by road from Waukaringa.

A large amount of good prospecting and development work has been done on the property ; lode formations of considerable width traverse the leases, and are traceable on the surface and in the various workings for a length of over 700ft.

The principal workings are situated on top of a long ridge, 50ft. above the plain and about 20ft. above the battery floor, and comprise one vertical shaft sunk to a depth of 214ft. and large open cut workings in the formation adjoining, about 200ft. long and 40ft. deep, and for a distance of about 400ft. farther E. along the line of strike at different points, crosstrenches, 8ft. to 15ft. deep, have been sunk, proving the lode formation to be of considerable width and to continue strong in that direction.

In the vicinity of the main shaft a fair amount of stoping has been done, but so far only a small portion in the centre of the formation has been operated on, leaving large quantities of lode material on each side of the channel made. The workings consist of an open channel 8ft. to 12ft. wide, stoped out from surface down to a depth of from 30ft. to 45ft., and for a length along the line of strike of 200ft. About midway between the E. and W. ends of the workings the lode formation has been crosscut through from wall to wall and proved to be 28ft. wide at that point, thus showing that some thousands of tons of lode material are available for stoping out from present level to the surface; and it is quite possible that the large portion of the lode near the footwall will prove as rich in gold, if not richer, than the part of the lode already worked.

In all parts of the workings the lode formation is fairly defined and appears likely to continue down. It consists chiefly of quartz, sandstone, and iron veins, containing coarse and fine gold, and in places fairly rich patches of gold have been obtained in the iron and quartz veins.

From the present workings 2,971 tons of ore have been extracted and treated, giving a return of 2,020ozs. of gold, valued at £7,670, equal to £2 11s. 8d. per ton.

E. from the main open workings along the line of strike, for a distance of over 300ft., a fair amount of good prospecting has been done at different points by open cuts across the trend of the lode, and carried down to depths of from 10ft. to 20ft. deep. In all these open cuts the lode formation consists of ferruginous quartz, iron veins, and other lode stone for a width of from 20ft. to 30ft., the formation appears very promising for continuance to a great depth, and likely to contain rich shoots of ore, as shown by a number of samples taken from the various workings along the line of lode.

From the most E. point, where the formation has been cut across and tested, to the W. end of the main open workings, a distance of close on 700ft. along the line of lode, there are thousands of tons of lode material available that could be cheaply and easily stoped out to a depth of at least 40ft., by starting an open cut work the full width of the formation on the E. slope of the hill and continuing the work W. This would give an enormous quantity of ore for treatment, and being close to the crushing plant it should return a very fair profit, and the information obtained in working such a large ore body should be of great assistance in selecting a site for a main working shaft and the future development of the mine.

Ten samples of lode material were taken from the various workings along the line of strike—

No. 1. From trench 15ft. deep and 60ft. E. from main workings, gave 1oz. 15dwts. gold and 4dwts. silver per ton.
No. 2. Underlie working 12ft. deep, 5dwts. gold per ton.
No. 3. Cutting 20ft. deep, 8dwts. gold per ton.
No. 4. Cutting 15ft. deep, 4dwts. gold per ton.
No. 5. E. end of workings, 1oz. gold and 5dwts. silver per ton.
No. 6. E. side close to deep shaft, 1oz. 14dwts. gold and 6dwts. silver per ton.
No. 7. N. end of crosscut, 22ft. level, 1oz. 5dwts. gold and 12dwts. silver per ton.
No. 8. Centre of lode for 8ft. in crosscut, 1dwt. gold per ton.
No. 9. W. end, 40ft. back from face, 47ft. level, 4ozs. 5dwts. gold and 1dwt. of silver per ton.
No. 10. Dump—prospecting hole 7ft. deep, and 1 chain W. from main workings, 3dwts. gold per ton.

Sample taken from the dump near water shaft, 1,800ft. E. from main workings, gave a trace of gold; and one sample taken from the dump of the S.E. shaft gave 2dwts. of gold per ton.

In an E. direction, about 1,800ft. from the main workings, a shaft has been sunk to a depth of 340ft. vertical, with the object of obtaining an adequate water supply for the crushing and cyanide plants, but up to the present it has not been the success anticipated, and only a limited supply can be obtained.

From the 301ft. down to the bottom (340ft.) a small quantity of water is making in the shaft, but not sufficient for the requirements of the mine; it appears that the belt of country sunk in will not let the water through, or that the shaft has not been sunk quite deep enough into the water channel. A further expenditure of a little more money should be made in putting down a bore in the bottom of the shaft, or crosscutting the country may intersect a good flow of water.

The water trouble has all along been a great obstacle in working this property; when that has been overcome and the mine opened out and worked in a proper manner it will have a reasonable chance to become a highly remunerative venture. (4–12–12.)

H. Darley's Mineral Claim.—Situated at Lovely Gully, seven miles from Waukaringa.

A fair amount of surface prospecting work has recently been done at different points in three parallel lode formations traversing the property, bearing N. 60° E. and going down vertical.

From the surface of the outcrop of No. 1 lode a shallow pit has been sunk to a depth of 4ft. The lode material exposed at this point is chiefly quartz, a vein 6in. wide containing iron pyrites and a little gold.

A number of prospecting holes, 20ft. to 30ft. apart, have been sunk at various points along the line of strike of No. 2 lode to a depth of from 4ft. to 7ft. The lode formation disclosed in the various holes consists chiefly of ferruginous quartz with iron pyrites, 12in. to 18in. wide, carrying gold; and it is said that a fairly rich specimen stone showing nice gold was obtained in one of the workings close to the surface. This lode, where exposed in the various workings, is strong and well defined, and has every appearance of continuing down to a depth.

Several shallow holes have been made to depths of from 3ft. to 5ft. along the outcrop of No. 3 lode, which consists of 6in. to 12in. of quartz and ironstone carrying gold.

Four samples taken of the lode material show on assay the ore to be of low value near the surface.

One sample from No. 1 lode gave 3dwts. of gold per ton.
Two samples from No. 2 lode; one gave 2dwts. of gold per ton and one nil.
One sample from No. 3 lode gave 1dwt. of gold per ton.

The work done so far on the property is of small extent and shallow, and the lodes in the present workings do not appear to contain much value; the ore bodies are well defined, the matrix is highly mineralised, and the indications are of a favorable nature for the occurrence of rich shoots of ore.

Probably the best and cheapest way to further prove this property will be to continue prospecting work along the outcrops and take samples of the ore to thoroughly test the lodes before going to the expense of shaft sinking.

Ochre Mine.—Situated near Oodla Wirra. A short distance N. from the main workings a new shaft has been started and sunk to a depth of 20ft.; at the 15ft. level in the shaft a drive has been extended 18ft.; in the face of the drive a winze has been sunk to a depth of 10ft. The ochre seams disclosed in the shaft and drives are from 9in. to 24in. wide, and appear likely to improve in width going down.

About 40ft. further W. open workings have been carried down to a depth of 10ft., and a drive from the bottom has been put in 12ft. in a S. direction on the course of nice seams of ochre, varying in width from 6in. to 12in.

Six tons eight hundredweights of the ochre obtained from the above workings were recently sent to market.

At different points on the property several prospecting holes have recently been put down to depths of from 3ft. to 5ft., and the prospects of intersecting other seams of ochre on the block are very encouraging. (6–12–12.)

Langsford Mineral Claim (formerly "Laura Syndicate," *vide* Record, page 211).—Situated at Lovely Gully, eight miles N.W. from Waukaringa.

A large amount of prospecting work has recently been done on this block. Several shafts and open cuts to shallow depths have been made at various points along the line of lode.

No. 1 shaft, situated 10ft. E. from the old workings, is down a total depth of 20ft. A drive E. from the shaft has been carried in 15ft. A vein of fairly high-grade ore is disclosed in the drive, bearing E. and W. and dipping N. at an angle of 40°. The vein material consists chiefly of siliceous ironstone, 6in. to 12in. wide, containing seams and bunches of copper ore—chiefly malachite—and copper glance, also a little gold and silver.

No. 2 shaft, situated 30ft. further E., is down a total depth of 25ft., and driving is in progress in the ore body, which consists of siliceous ironstone containing a small percentage of copper. The vein is fairly defined and likely to go down. About 2 tons have been extracted from the workings, and, as shown by the three samples taken, is of fairly high grade.

No. 1. From ore dump, 14·2 per cent. copper, 2dwts. gold, 1oz. 2dwts. silver.
No. 2. From E. drive, 32·6 per cent. copper, 4dwts. gold, 3ozs. 12dwts. silver.
No. 3. From dressed ore, 42·0 per cent. copper, 5dwts. gold, 2ozs. silver.

About 5 chains E. from the last workings a considerable amount of prospecting work has been done on a N. and S. formation, dipping W.; several holes have been put down at various points for a length of 2 chains, and one shaft sunk 20ft. vertically and 10ft. on the underlie. The lode material disclosed in these workings is chiefly ferruginous clayslate and quartz veins with a little green carbonate of copper and copper stains in the matrix, but not in payable quantity at present depth, as shown by the three samples taken.

One sample from E. hole, 5ft. deep, gave 1·6 per cent. copper and 1dwt. gold per ton.
One sample from dump gave 0·7 per cent. copper and 1dwt. gold per ton.
One sample from bottom of shaft, 30ft., gave 2·3 per cent. copper and 1dwt. gold per ton.

The prospects so far in the present shallow workings are encouraging; the country for a considerable area in the locality is highly auriferous; a fair quantity of gold has been found in the alluvial deposits of the adjacent slopes and gullies. Judging from surface indications and what can be seen in the various workings, there is a reasonable chance of discovering payable lodes in this district. The property is well worth being more thoroughly prospected. (6–12–12.)

Dustholes Gold Mine, near Mount Grainger (*vide* Record, page 214, and Reviews Nos. 8, 13-16).

Since my last visit to this mine a Broken Hill syndicate has acquired this property.

The large lode formation, known as the Dustholes lode, appears to traverse the whole length of the five blocks held, and at various points for a considerable distance along the line of strike a fair amount of work has been done at different times in the

formation, which is from 20ft. to 25ft. wide; and large parcels of gold-bearing ore were extracted from the various workings, yielding from 6dwts. to 15dwts. of gold per ton.

The principal work carried on by the present syndicate is situated on the top of a hill 100ft. above the plain.

A new underlie shaft was started in the lode formation and has now been sunk to a total depth of 100ft. Ferruginous lode material of promising nature is disclosed all the way down the shaft, with several seams of quartz and iron crossing the formation. Some of the seams contain fair values and others are poor and carry no values at the point intersected in the shaft. A sample taken at the 40ft. level gave a trace of gold. Sample taken from a seam of ore 12in. wide at the 50ft. level gave 8dwts. of gold per ton.

A sample from a vein of ore 20in. wide at the 83ft. level gave a trace of gold.

One sample taken from a dump of ore obtained from No. 2 vein, 50ft. level, gave 8dwts. of gold per ton.

The gold-bearing material in the present shaft is of similar nature to that disclosed in other workings along the line, which proves that the formation extends for a considerable distance on the line of strike, and has every appearance of continuing down. (10–12–12.)

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